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SAFETY 1978

JANUARY 1978

UNITED STATES AIR FORCE

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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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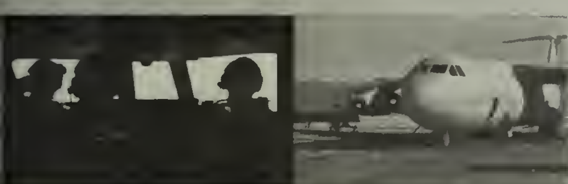
JANUARY 1978 AFRP 127-2 VOLUME 34 NUMBER

Readiness

C-141 Participation In RED FLAG

CAPTAIN JAMES J. LAWRENCE
Directorate of Aerospace Safety



"National security policy and the very real threats the US faces have changed considerably since 1947, and evolution of the Air Force has been necessary to keep pace with these changes. I can report that the Air Force today is in good shape." This quote was from Air Force Chief of Staff General David C. Jones, made during a recent interview with *Air Force Magazine*.

The average airman, however, might ask, "How can the Air Force be in good shape?" since we all face the growing challenge of doing more with less. This question becomes especially relevant when you view the increasing dedication of the Soviet government to the building of their offensive and defensive capability.

Aerospace Safety magazine feels that part of the answer lies in personnel. Our people today are better trained, more dedicated, and have a higher level of motivation than ever before in the 30 years of Air Force history. Still another part of the answer lies in our weapon systems capability and new weapon system development. Modernization of our tactical fighter force is progressing steadily, and several new aircraft and missiles are planned for the near future.

The best people and the best equipment, however, are two entities that must totally mesh together to achieve the responsiveness necessary to meet the threat of Soviet military build-up. Support strategy must also be integrated so that the whole system reach-

This specially camouflaged C-141, nicknamed the "Star Lizard," was on loan to the 63d MAW from Twenty-First Air Force headquarters. Aggressors reported it significantly harder to sight than the standard painted Starlifters.

READINESS continued

es its utmost efficiency. In order to ensure that the armed forces are prepared to meet any enemy threat in any theater of operations, the DOD is emphasizing the concept of readiness. Training to achieve this readiness state is a continuous Air Force concern. The best people, equipment and support need to be integrated and tested through a program of operational exercises to refine plans and procedures.

This is the first of a series of *Aerospace Safety* articles dealing with the Air Force's efforts in readiness training. Our first look is into MAC's strategic and tactical airlift role in the nation's offensive and defensive strategy. The concept of tactical airlift is obviously critical. One of our major concerns is our ability or inability to meet the full requirement for rapid deployment of US Armed Forces or supporting equipment to the NATO theater. To test this airlift capability, MAC participates in the RED FLAG training program at Nellis AFB, Nevada.

For the unenlightened, RED FLAG is a training program with the goal of exposing tactical and combat airlift crews to the most realistic combat simulation that peacetime conditions allow. It simulates a NATO scenario and tests USAF procedures and plans by creating a war game situation, complete with expected ground and air enemy military strengths.

One portion of the RED FLAG exercise deals with MAC's ability to penetrate enemy defenses and make a simulated troop airdrop on a designated drop zone (DZ). The exercise includes all planned clo
air support, surface to air missile (SAM) suppressio
high altitude combat air patrol defense (MIG CAI
aggressors and ground SAM and AAA, 57 millimet
defense sites. It also provides airlift with the oppo
tunity to practice their combat airdrop mission (CAI
tactics in a real war, real time scenario.

Upon invitation from the 63d Military Airlift Wi
at Norton AFB, *Aerospace Safety* participated in t
RED FLAG exercise held in November. I attend
the tactical briefings and debriefings and acted as
flight deck observer on number three of the four sh
C-141 Starlifter formation that flew to the simulat
battlefield at Nellis AFB. This article will recap t
events of that experience from a crew member's vie
point. Although not a supersonic, G pulling terror, t
C-141 displayed capabilities that impressed and, qu
frankly, surprised me.

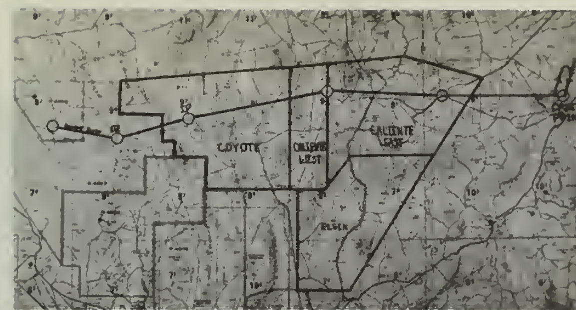
RED FLAG planning begins in the 63d's coml
tactics shop. There, the liaison with the TAC supp
people at Nellis AFB takes place. RED FLAG 78
was by no means limited to just a measure of air
capability. The exercise, scheduled to run from
October to 18 November 1977, tested all aspects
offensive and defensive tactical strategies in the Eu
pean theater. Aircrews engage in activities such
search and air rescue (SAR), interdiction, compos
strikes, sector attacks, and nuclear strikes. CAP esc
is practiced in defense of strike, reconnaissance, SA
or airlift forces. SAM suppression is flown in supp
of attack forces with enemy ground defense sites
tacked. FACs generate targets for close air supp
strike sorties. All encounters and engagements
scored by the Nellis RED FLAG training facil
The data are then analyzed and form the basis
tactics or planning changes.

Well. where does a MAC C-141 or C-130 fit i
this world of fighters? The ability to move grou
troops and support equipment is an intgeral part
the wartime simulation, just as significant as air sup
ority. The survivability of these air lifters must
adequate to meet the ground force needs. Tactics

Approaching the Drop Zone, the number two C-141 opens its cargo doors in preparation for a simulated drop of ground reinforcement troops.

The C-141 performs a "Weed Slowdown Maneuver," popping up to 1,000' AGL and droppin
payload over the center of the Drop Zone.

aggressor aircraft sights in on a Starlifter after successfully evading F-15 G CAP support. The C-141 takes evasive action.



The route of TWAIN 21 flight from orbit point to Drop Zone took 33 minutes to fly. SAM and AAA sites were set up along the entire track.

Number three moves into formation position behind number two prior to the orbit point.

otecting them must be developed, practiced, and fined, and the effect of their combat maneuvering ust be evaluated. A C-141's ability to pinpoint the op of troops or much needed supplies could spell e difference between success or failure of our ground rces.

This is one of MAC's tactical airlift roles in Ameri-'s war plans. The 63d MAW is the only C-141 ing in MAC's Twenty-Second Air Force tasked ith the CAM role. The crews are specially trained the CAM tactics required to effectively accomplish is demanding and important mission.

The process begins with the Blue Force (good guys) anners issuance of a fragmentary order (FRAG) to e combat tactics people at Norton. This FRAG out-nes the Blue Force's aircraft requirements, takeoff me, routes, range area reservation, target, and time ver target. Combat Tactics then tasks the flying quadrons for crews to man the missions. The 15th nd the 53d Military Airlift Squadrons are the two nits that fulfill the CAM role for the 63d. I decided fly with the 53d Blackjacks in number three. There ere two reasons for this selection. First, number ree is in a good visual position to observe the ma-euvering and tactics of numbers one and two. Secondly, number three was a specially camouflaged, inertial navigation system-equipped, C-141 Starlifter on loan from Twenty-First Air Force headquarters at McGuire AFB.

The stage was set for this mission a week prior when personnel from the RED FLAG planning staff came down to brief the MAC aircrews. A full airdrop profile was planned with complimentary support. The C-141s would pick up A-7 escort at the orbit point and fly navigation legs at 500' above the highest ground point. The drop altitude was decided as 1,000' AGL over the DZ. A bundle would be parachuted out of the troop doors to simulate the airdrop of personnel.

My mission was to be flown on the morning of 2 November 1977. To allow sufficient time for pre-mission briefings, the ungodly hour of 0245 was designated as show time. I dragged myself into the CAM briefing room, just barely on time, and was amazed by the tolerance of MAC crews to such inordinate crew scheduling procedures. They not only appeared awake, but there was an encouraging enthusiasm which I found to be highly contagious. CAM to the MAC aircrew is a pleasant respite from the hour-upon-hour monotony of over-the-pond flights. For all pilots, the occasional escape from the ATC womb of

Number four moves up on number three during Combat Airdrop Mission exercises.

READINESS continued

flight restrictions brings them back closer to their aviation roots. Today would be special, and today would be fun.

My flight crew wore shoulder patches indicating they were a Select Lead Crew. This was comforting to me and my life insurance company. The maneuvers planned for the 200,000 pound monolith were disconcerting, to say the least, for this novice observer. These were the men I flew with:

Capt Rich Musch—Flight Examiner/Aircraft Commander performing copilot duties.

Capt Kirk Benson—Instructor performing pilot duties.

Capt Steve Bunn—Instructor Navigator for the CAM portion of the flight.

1Lt Dave Marjamaa—Instructor Navigator for the mission.

1Lt Ken Hahlbeck—Copilot qualified system operator.

MSgt Bill St. Clair—Flight Examiner Loadmaster.

SSgt Raul Pequeno—Flight Engineer.

After weather, intell, and final instruction briefings, we headed out to the camouflaged Starlifter. The paint scheme on this C-141 is in the test and evaluation phase and was developed specifically for tactical airlift operations. On a previous RED FLAG sortie, aggressor aircraft found it significantly harder to pick out the camouflaged bird over those with standard grey and white paint and markings. Its success affectionately warranted a new nickname. The "Star Lizard" seemed most appropriate.

Preflights and checklists were completed, and at 0500 TWAIN 21, flight of four C-141s, started engines. The formation taxied out for takeoff. At scheduled departure time, the first Starlifter released brakes and began its takeoff roll. Simultaneously, number two moved into takeoff position and ran up its throttles to takeoff power. As soon as number one was airborne, two began its roll; three and four follow[ed] suit. The four ships were safely airborne and tuck[ed] in, so to speak, in 6,000-foot trail. The flight w[as] cleared to a block altitude of 15,000 to 17,000' MS[L]. Each aircraft was to maintain a 500' altitude separati[on] on each other during the enroute portion.

As the flight approached its designated orbit poi[nt] a descent was initiated to 1,500' AGL. Numbers tw[o,] three and four set up their proper formation positi[ons] while in the orbit and at the FRAG range reservati[on] time, TWAIN 21 flight began its run. The first sighti[ng] of friendlies came shortly thereafter as eight A-7s fro[m] the 169th Tactical Fighter Group at McEntire ANG[B,] SC, and the 355th Tactical Fighter Wing at Dav[is-]Monthan AFB, AZ, moved in on the formation. Th[eir] role is to provide escort and close air support for t[he] airlifters.

Ground threats in the form of enemy troops, AA[A] 57 millimeter guns, and SAM installations are attacke[d]. At this point, the C-141s have accelerated to 300 k[nots] indicated and the A-7s circle the formation, reminisce[nt] of indians surrounding the wagon train. Here the Sta[r]lifter crew practice CAM tactics while still keepi[ng] the flight tight enough for the A-7s to patrol.

Up ahead, but out of sight, are the F-105G Wi[ld] Weasels from the 35th Tactical Fighter Wing at Geor[ge] AFB, CA. These daring young men move in ahead [of] the convoy to root out and destroy the SAM and AA[A] threats. Keep in mind that the exercise is constant[ly] being graded. That is, SAM and AAA sites have com[]puter-generated kill or miss parameters. The F-10[5s] are also computer scored as to site destruction and ai[r]craft lost. By the time the C-141s come over, many [of] these defense sites are gone. Even if computer d[e]stroyed, however, aircraft and ground defense contin[ue] operating to maximize training opportunities. Later, t[he] RED FLAG White Force (scorekeepers) study the i[n]puts and decide who got who and when. A SAM si[te] destroyed earlier can't get a hit credit on the C-14[1]

A-7 escort/close air support aircraft joined the flight at the orbit po[int] and stayed with us until the Drop Zone.

…poor visibility or IFR conditions, the C-141s can maintain formation …sition by usng their airborne radar.

Number three's shadow is seen moving across the desolate Nevada desert. At this point in the flight profile, the C-141s were at 500' AGL moving at 300 knots.

…hen he later streaks by.

Shortly after picking up the A-7 escorts, a Navy …A6B, out of the Naval Air Station at Whidbey Island …Washington, joined the center of the C-141 forma…on. His purpose was to supply airborne radar ad…isories on potential aggressors. Working the GCI UHF …adio frequencies, the EA6B soon called enemy aggres…ors up high. These aggressors came courtesy of the …ighter Weapons School at Nellis AFB. There, specially …quipped T-38s and F-5s are used as MIG simulations …nd are painted in Soviet colors. The T-38 and F-5 …ere chosen because of their light weight and maneu…erability which are similar to the capability of Soviet …IIG fighters.

Flying combat air patrol (CAP) for TWAIN 21 …ight were F-15 Eagles out of the 1st Tactical Fighter …ing at Langley AFB, VA. The F-15s engaged the …ggressors at high altitudes in an attempt to protect the …ormation and its precious cargo. Any aggressor that …urvived the F-15 encounter could come down and en…age the slower moving cargo aircraft. The F-5s did …ome down to attack the flight of C-141s and the A-7 …scorts. This gave the C-141s an opportunity to prac…ce evasive maneuvers. At this point in the profile, the …-141s had dropped to 500' AGL. As the aggressor …as called at a Starlifter's 6 o'clock position, the cargo …ircraft would initiate hard 60° bank moves, left and …ight, in an attempt to avoid being hit, until an A-7 …ould get over to help out. A 60° bank in a C-141 at …00 knots and 500' up can be sporting, indeed.

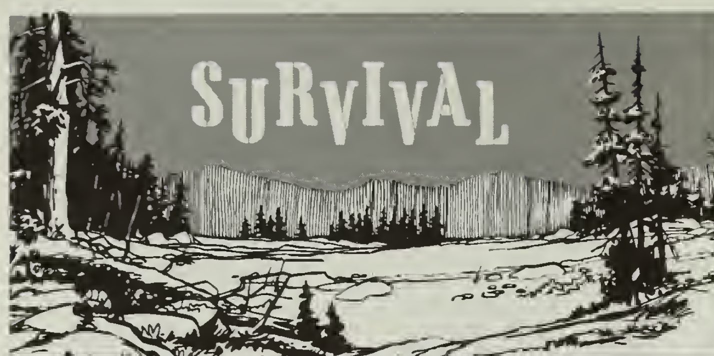
After the aggressors broke their engagements, the …-141s reached their IP. The flight moved into position …or the run to the DZ. At 6 miles out, the flight deploys …poilers to slow down to 190 knots. Flaps then come …own, and the flight maintains an airspeed of 160 …nots at 500' AGL. Each aircraft performs what is …alled a "weed slowdown maneuver" just prior to the …Z. Here, the Starlifter pops up to 1,000' AGL and slows to 130 knots. At the navigator's signal, the loadmaster pushes the load out the rear cargo doors, simulating the bailout of troops and supplies.

Immediately following the drop, the aircraft dives back down. raising the flaps and closing the cargo doors as the airspeed increases. They accelerate to 300 knots and perform escape maneuvers until out of the restricted area. The flight then slows down to 250 knots for an IFR assembly and return to Norton AFB.

Drop results were announced after the mission at the debrief/hangar flying session. The 63d was again successful in meeting its airdrop commitment on time and on target. RED FLAG requirements state that the drop can be anywhere in the designated drop zone. The 63d further delineates a successful drop as within 360 yards of the center point of target zone. Number one's load hit within 50 yards at the target's one o'clock position. Dead-eye number two was right on the center of the zone. Number three hit 150 yards at 6 o'clock, probably due to the extra weight in the cockpit. Four tallied a hit 80 yards at 3 o'clock.

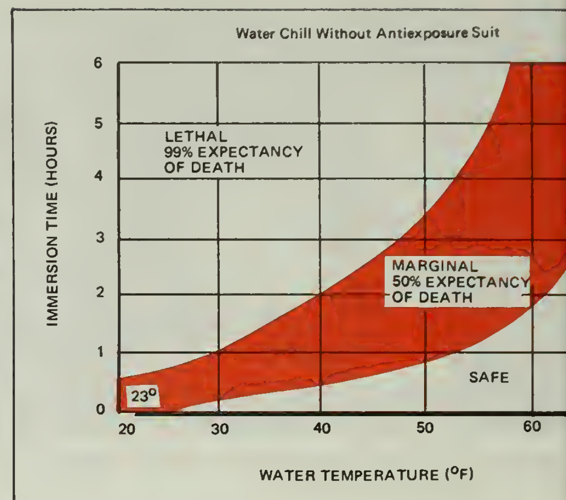
The concept of readiness is one of the major challenges facing the US Armed Forces today and in the near future. Preparation for this demand can only come with realistic training simulations to evaluate the effectiveness of our plans and performance. This is the goal of readiness training. The Military Airlift Command strives to meet its tactical airlift commitment through extensive CAM training and participates in joint command and joint service exercises. *Aerospace Safety* will continue to report the USAF readiness training program in a series of articles dedicated to that subject.

Aerospace Safety wishes to thank the 63d Military Airlift Wing, the 53d Military Airlift Squadron, and especially Capt Jeff Groggan of the 63d's Combat Tactics Office for their assistance during this mission and during preparation of this article. ★



Cold Water Immersion

SSGT WILLIAM C. JOINER
Det 1, 3636 CCTW (ATC)
Eielson AFB AK



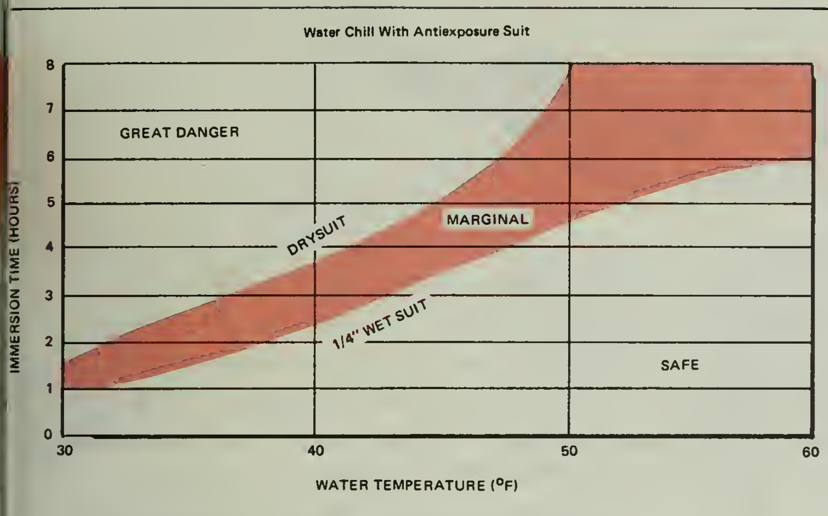
Survival in icy arctic waters is a subject that grabs the attention of all aircrew members. They know that mechanical failure, human error, or enemy action could render their aircraft unsafe. Since such mishaps only happen to the OTHER GUY, many of us unconsciously drift into a state of complacency and become a liability rather than an asset to the search and rescue (SAR) system.

In a survival situation the life expectancy of an injured person decreases as much as 80 percent in the first 24 hours following an accident, while the chances of survival of an uninjured survivor rapidly diminishes after the first 3 days. In the case of a seriously injured survivor in frigid waters, the reaction time of the SAR system must be measured in minutes. These times become more important when adverse weather prevails in, or approaches, an area where survivors are located, since it will limit the time available to conduct a SAR mission. Not only are survivors more difficult to detect in adverse weather, but the SAR units operate at much less efficiency due to the turbulence, rough seas, and higher stresses on both the search personnel and their aircraft.

Each individual will vary in his reaction to cold stresses. Physical factors which will affect a survivor's life expectancy include the type of clothing worn, the clothing's wetness, the survivor's activity during his exposure, initial body temperature, physical condition, thirst, exhaustion, and hunger. Various psychological stresses such as isolation, loneliness, remoteness, and the all important individual will-to-live, also impact upon one's survivability. Some individuals will exceed the life expectancy or tolerance times indicated by the graphs, and therefore we should consider these figures as helpful guidelines rather than absolute controlling factors.

The body will cool when immersed in water having a temperature of less than 92°F. The warmest ocean water that can be expected at any time of the year is 84°F. The rate of body heat loss increases as the temperature of air and water decreases. Water allows a rate of heat exchange approximately 25 times greater than that of air at the same temperature, causing hypothermia (lowering of body core temperature) to occur very rapidly. If a survivor could be removed from the water and put aboard a raft, his survivability would increase even though he may be exposed to the cooling effects of water evaporating on his skin. Figure 1, Water Chill Without Antiexposure Suit, depicts the life expectancy of survivors immersed in water wearing typical clothing. The spread of time indicated in the marginal portion of the graph is the period in which survivors will usually lose consciousness and then drown.

In water temperatures above 70°F, survival time depends solely upon the fatigue factor of the individual. Some individuals have survived in excess of 80 hours at these temperatures. Staying afloat and dealing with boredom are the major problems at these temperatures. Between 60° and 70°F a



erson can survive up to 12 hours. om 50° to 60°F, a survivor has reasonably good chance if rescue completed within 6 hours. In the mperature range from 40° to)°F, only about 50 percent of any oup of people can be expected survive longer than 1 hour. ater temperatures between 35° ıd 40°F impose severe condi- ons for survival, and most sur- vors will not live longer than 1 our. In water temperatures of 5°F and below the survivor suf- rs severe shock and intense pain ı entering the water. This shock some instances may be fatal ue to loss of consciousness and ıbsequent drowning.

Figure 2, Water Chill With Anti- (posure Suit, depicts the toler- ıce time of survivors immersed water while wearing either a ne-fourth inch foamed neoprene et suit or a survival dry suit. This aph provides the expected times r a person to become either nconscious or experience severe g cramps, stomach cramps, and ain in the hands and feet which educes endurance drastically. his very painful experience will ontinue until numbness sets in.

At this point many crew mem- ers are probably thinking that heir flesh will freeze if they get out of the water, so let's check the facts. At an equivalent temperature of approximately −25°F exposed flesh may freeze within 60 seconds. At an equivalent temperature of about −75°F, exposed flesh may freeze within 30 seconds. However, exposed flesh will not freeze at temperatures above freezing no matter how high the wind velocity.

When water entry becomes inevitable, the following suggestions will buy you precious time and may save your life:

- Whatever happens, try to keep your head clear of the water. It is possible to lose as much as 75 percent of body heat through the head. Therefore, the use of drownproofing techniques is not advisable in frigid waters.

- If you can get out of the water and into a raft, do so. Sit on your seat kit or any available insulating material for protection from the cold water below. Remove as much water as possible from the antiexposure suit and flight clothing, and cover exposed flesh to minimize the effects of wind chill.

- Unless land is within easy reach, holding still is preferable to swimming or other vigorous movement. An open body position (i.e., swimming, drownproofing) does not guard against body heat loss and will cause the rapid onset of hypothermia. While holding still in cold water, cover the sides of the chest area and groin region to gain nearly a 50 percent increase in predicted survival time. When alone in the water, this behavior involves holding the inner side of the arms tight against the side of the chest and raising the thighs to close off the groin region. People in a group should huddle in a tight circle so that the sides of the chests of different persons are held close together and the thighs and hips are touching.

Wear an antiexposure suit when your flight plan carries you over frigid waters and lower the temperature of the aircraft heating system to compensate for the suit discomfort. Don't wait until the emergency is present and there's just not enough time.

Questions or comments concerning the information contained in the article should be addressed to Operations and Requirements Branch (DOTO), 3636 CCTW (ATC), Fairchild AFB WA 99011 or AUTOVON 352-5470. ★

THERE IS A WAY

Annually the Air Force recognizes a given number of individuals, units and commands for outstanding performance in safety. However, competition is keen and not all win major awards. To recognize all of those, AEROSPACE SAFETY is featuring one or more in each edition. In this way we can all share in recognizing their fine performance and, perhaps, learn some valuable lessons.

Nominated For The Colombian Trophy

55th Strategic Reconnaissance Wing

The 55th Strategic Reconnaissance Wing has a diverse mission operating worldwide, 365 days a year. During 1976, aircraft assigned to the 55 SRW logged more than 22,000 flying hours. This includes the EC/RC/KC-135 aircraft and the Air Force fleet of E-4 aircraft. These missions are predominantly directed by higher headquarters to support worldwide reconnaissance, SAC command and control and National Emergency Airborne Command Post requirements, in support of national security considerations.

Throughout 1976 the 55 SRW flew a demanding and diverse mission with no accidents. To accomplish that performance required an innovative approach to the wing's special problems.

A launch supervisor or mission monitor is assigned to all higher headquarters missions, which allows the Supervisor of Flying the freedom to oversee the overall operation of the airdrome.

Crews deploying overseas receive special simulator training covering such items as instrument approaches to destination locations.

Aircrews are surveyed at flying safety meetings for their opinions and recommendations on problem areas.

An accident-free year is a record of success in mission accomplishment and safety. The 55 SRW in achieving that record earned nomination for the Colombian Trophy.

51st Composite Wing (Tactical)

The 51st Composite Wing (Tactical) was officialy formed on 30 September 1974, when the 36th Tactical Fighter Squadron and the 19th Tactical Air Support Squadron were permanently assigned to the wing. During the period from 30 September 1974 to 31 December 1976, the wing flew 27,138.9 accident-free hours in F-4, OV-10, and T-33 aircraft.

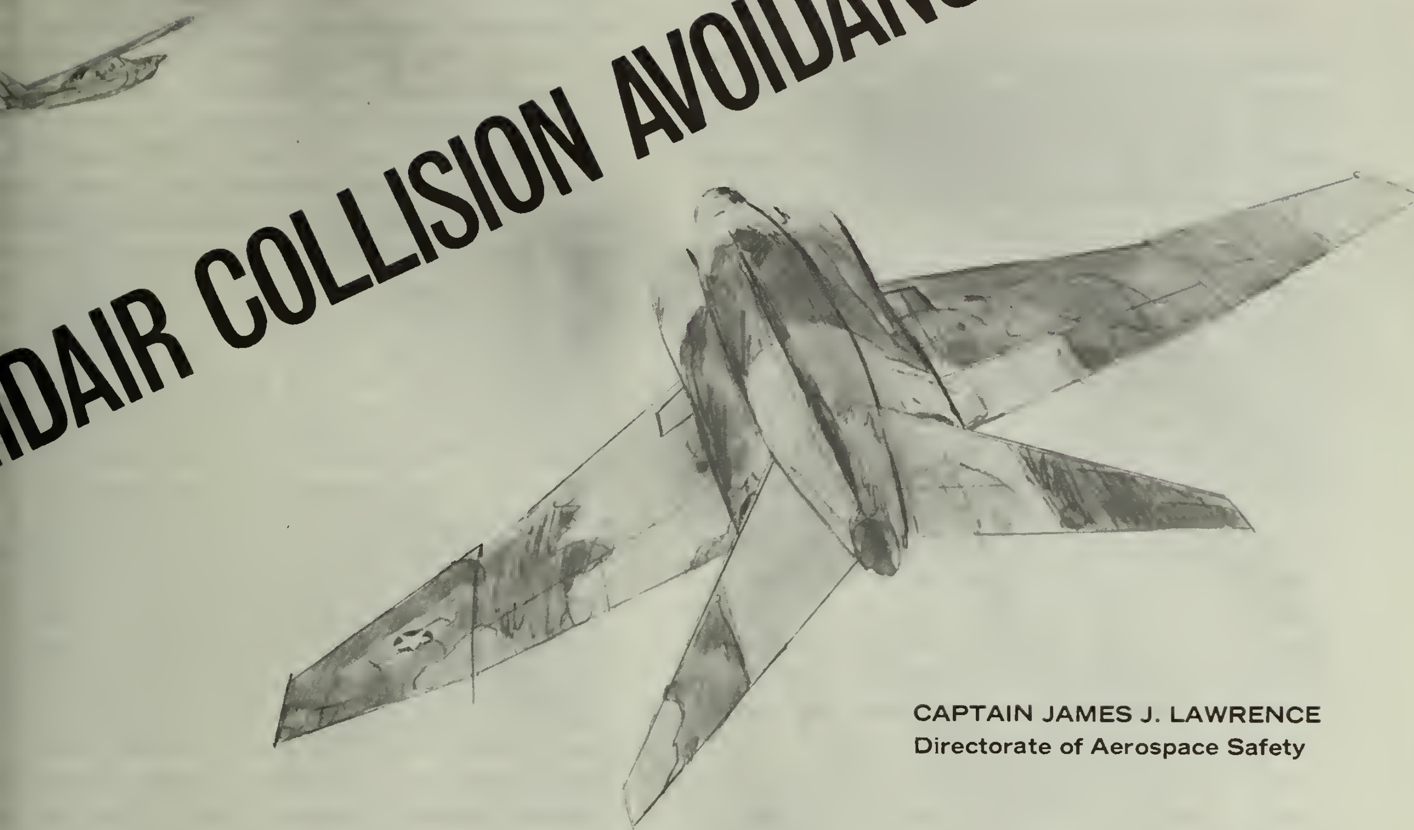
In 1976, the wing experienced a 7 percent reduction in its incident rate for F-4 and OV-10 aircraft while performing a great variety of operational tasks. The primary task of the F-4 squadron is air superiority, with a secondary task of close air support. The OV-10 squadron works closely with the US and ROK Armies in training Forward Air Controllers and in controlling both USAF and ROKAF fighters on close air support and search and rescue missions.

The mission of the 19th Tactical Air Support Squadron is to maintain equipment and a nucleus of personnel in a high state of preparedness as a theater resource to satisfy Tactical Air Support (TAS) requirements of the PACOM Tactical Air Control System (TACS). Additionally, it provides the Commander, 51st Composite Wing (Tactical), with equipment and personnel to meet peacetime TAS requirements of the Korean TACS in support of the US Army.

The mission of the 36th Tactical Fighter Squadron is to maintain a highly trained force of combat ready aircrews capable of accomplishing counter air, close air support, air interdiction, and strategic attack missions assigned or directed by the parent wing or higher authority.

Staff assistance visits and inspections found the wing Flight Safety and overall safety programs to be excellent and exceptionally well managed. ★

IDAIR COLLISION AVOIDANCE



CAPTAIN JAMES J. LAWRENCE
Directorate of Aerospace Safety

AF 30479 initiated its descent from flight level 350. The crew is tired. Mission commitments required scheduling for the full 16-hour crew ty day. Alert time was 0200, with an 0300 show r the 0500 takeoff. It's now dusk. The crews' eyes e weary. The copilot is busy calling the command st, and the pilot is having a difficult time getting a ck on the next TACAN station. As they pass 7,000 r 5,000, Approach calls pop-up traffic at 10 to 11 clock, 1 mile, heading west, squawking VFR. The ot acknowledges the call, glances outside, and when doesn't sight the aircraft, returns to the TACAN set.

7513 Romeo departed his home field around sunwn. The private pilot was stuck at work later than anned and had to rush to make his 1730 Fixed Base perator aircraft reservation time. He had originally ended to file a VFR flight plan, but the lack of ne available cancelled that idea. He was only going do some sightseeing with his friend, so he pressed . They just made it in time, too. By 1745 they were borne. The sky was clear, but visibility ahead was stricted by the glare from the setting sun. He was veling at 6,500' when he leaned over to point out the y layout to his friend.

People on the ground were intrigued by the bright ange flame that lit up the sky. A bit late in the year for fireworks, they thought, until the flaming debris began to fall. All souls on board both aircraft were killed as a result of the midair collision.

* * *

Fortunately, this wasn't an accident that actually occurred, but the scenario is one that contains the elements that make a midair collision most likely. Let's take these same events, only this time add in one very important difference, a Collision Avoidance System (CAS).

AF 30479 is in his descent passing 7,000 for 4'000'. The copilot is talking to the Command Post, and the pilot is busy trying to tune the next TACAN station. As he reaches over, he notices a blinking light on his cockpit Proximity Warning Indicator (PWI). The light indicates traffic at 10 o'clock and below him 500 to 2,000'. He also knows that the blinking light means there is a potential collision threat, whereas a steady light indicates traffic in a zone of interest but not on a collision course. This signal begins 75 seconds before the point of closest approach.

Fifteen seconds later, the PWI gives the pilot a DON'T descend signal and a DO make a right turn and a DO climb signal. This is accompanied by an audible

Midair Collision Avoidance continued

warning. The pilot presses his Wilco acknowledgement button. He levels off and starts a right turn. The controller confirms the conflict signal and approves the evasive action. The Air Force crew never sees the other aircraft as it passes well clear past their left wing.

*   *   *

Both the FAA and the Air Force have been busy working the midair collision problem. Statistically, it is a problem of air carriers or the military colliding with general aviation aircraft. The air carrier or military aircraft is normally under Instrument Flight Rules and the other is under Visual Flight Rules and not participating in the ATC system. It's been a long time since two aircraft under positive radar control have collided. However, the increasing number of IFR near misses reported and the human error factor for both pilots and controllers, coupled with the ever-increasing density of air traffic, make an across-the-board midair collision avoidance program mandatory. A midair between two jumbo jets today, could more than equal all midair collision fatalities accrued to date.

The collision avoidance system described in the above scenario is not only technically feasible, the equipment has been developed and operationally tested. Total implementation, however, is a long way off. Cost of ground based equipment is high, and full general aviation participation will take years. Even if development funds were appropriated today, the system would not be totally operational for some time.

The Air Force, today, is participating in two collision feedback systems designed to minimize collision hazards. These are the Hazardous Air Traffic Report (HATR) program and the Aviation Safety Reporting System (ASRS). The remainder of this article will first describe the CAS portrayed in the above events. That will be followed by a look at the use and benefits of HATR and ASRS.

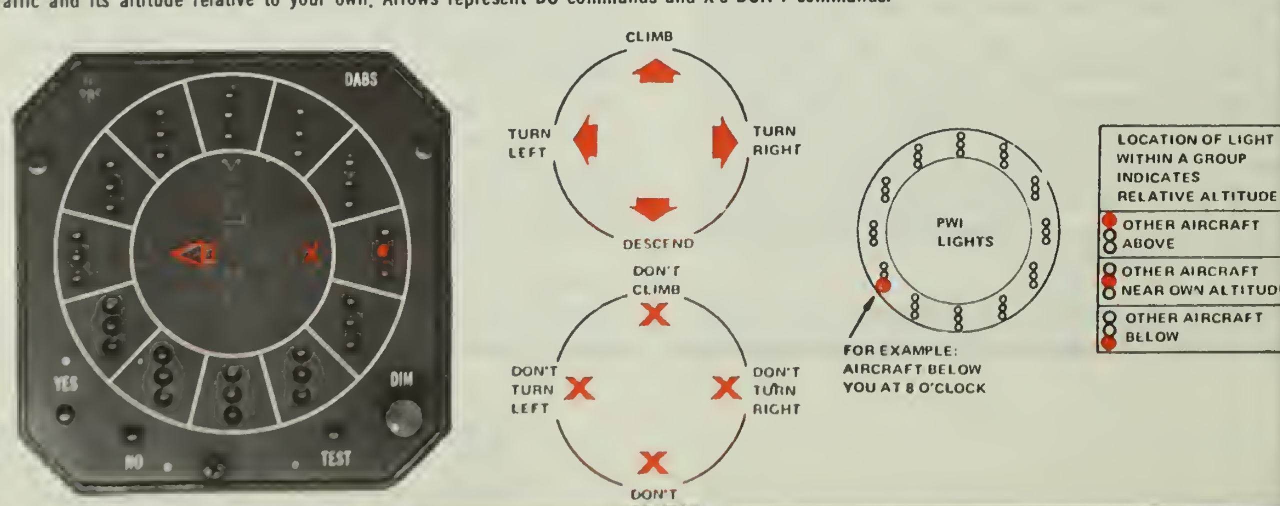
Originally, an ATC Collision Avoidance System was designated the DABS/IPC program. This translat to Discrete Address Beacon System/Intermittent Po tive Control. The system was recently renamed ATAR —Automated Traffic Avoidance and Resolution Sy tem. What these acronyms really mean is a joint pilo controller alert system to identify traffic conflicts b fore they become fatal. The human eye is often inad quate in identifying traffic conflicts, and modern j speeds make identification/reaction capability questio able. The prospects for a doubling of present air traff loads by 1990 demand a system even better than o present Air Traffic Control Radar Beacon Syste (ATCRBS). Cost and time considerations require system that can use the present ATCRBS while tran tioning to a proposed ATARS.

ATARS is not designed as a replacement for t controller's separation assurance role, but rather it intended as a back-up for failure of the ATC syste or a human error. ATARS withholds any actual c lision avoidance commands until the last moment which a collision can be safely avoided. ATARS o tains DABS position data for all targets in its servi area and performs tracking in order to establish veloci data on each aircraft. To receive ATARS service, aircraft must have a DABS transponder with altitu encoding capability, plus a Proximity Warning In cator display. The equipment will be affordable to t general aviation industry because the display is simp and because all the collision avoidance computatio are accomplished by ground based equipment.

The PWI described above consists of an outer ri of 36 lights in 12 groups of three, set in each positi of the clock. By lighting any one of these lights, t system is able to tell the pilot the relative bearing a the relative altitude of any intruder. Light positi indicates relative bearing of the bogie. The upper li indicates its altitude as 500 to 2,000' above; the cen light is for an altitude at or near your own; the low light is for an altitude 500 to 2,000' below.

This light indicator typically would come on 45 s onds before the closest approach. A blinking light

The cockpit Proximity Warning Indicator is simple in design and installation. The twelve groups of three lights indicate the position of the conflic traffic and its altitude relative to your own. Arrows represent DO commands and X's DON'T commands.



cates a potential collision threat while a steady light dicates traffic in a zone of interest but not currently a collision course. There is also a set of arrows and osses to tell the pilot whether or not to make a par-ular maneuver. Arrows tell the pilot to climb, de-end, turn left or right, while crosses tell him not to ce a particular action. Typically, the DO or DON'T mmand is first displayed 30 seconds before the closest edicted approach point.

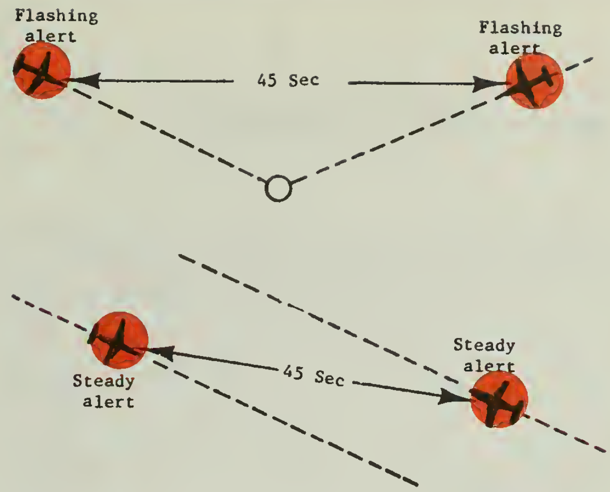
The DO or DON'T command is accompanied by an dible alarm system. The pilot is required to ac-owledge receipt of the warning by pushing either a ilco (yes) acknowledgement or an Unable (no) ac-owledgement button. A DABS contact indicator light always illuminated when the aircraft is in airspace in ich ATARS service is being provided.

When both aircraft in a potential collision course under Instrument Flight Rules, ATARS issues a ot warning and a "Controller Alert" message to the ponsible controller. If a VFR and IFR aircraft, both ABS equipped, are on a collision course, the ATARS ution strategy is to maneuver only the VFR traffic thout disturbing the aircraft under IFR.

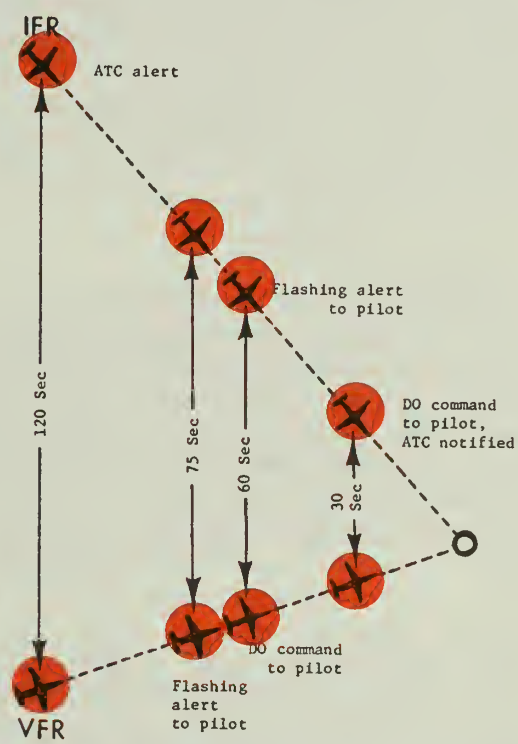
ATARS can also determine when one aircraft in an counter is fully DABS equipped and one has only present ATCRBS transponder with altitude en-ding. In this case, the fully equipped aircraft gets an tial signal 75 seconds (instead of 45 seconds) prior collision and an audible warning 60 seconds prior. nflict resolution information and maneuvering in-uctions are transmitted to the ATARS equipped air-ft. During this type encounter, the air traffic control- responsible for the controlled aircraft is alerted to conflict problem two minutes before the collision or ar miss point. If the controller does not initiate a neuver to resolve the conflict by the 75 second int, then the PWI message is sent to the pilot.

The ATARS is designed to back-up the basic ATC ntrol loop with an independent, automatic loop. Its k is to provide last ditch separation assurance with nimum disturbance to the flow of air traffic under control of the basic ATC system. Ample margin sts in setting detection thresholds so that ATARS l not intervene when an air traffic controller is main-ning normal separation standards. It is unlikely that ontrolled aircraft would receive ATARS DO/DON'T mmands or an audible warning when the ATC system operating normally. If a human error occurs, how-er, the system will back up the control loop and tell controller and then the pilot what to do to avoid the nger.

This CAS system or others much like it have been bated in Congress since early 1971. Hearings are

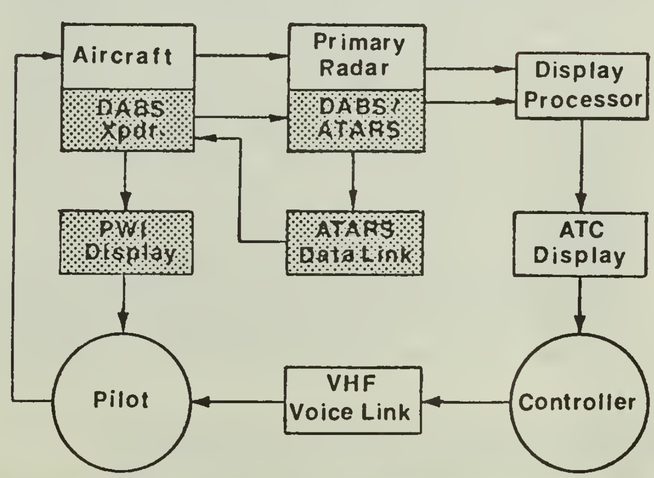


The PWI light will flash if you are on a collision course with the identified traffic. A steady light indicates an intruder in a zone of interest but not on a collision track.



This diagram explains the conflict resolution schedule under ATARS for an encounter between an IFR and a VFR aircraft.

This chart represents the control loop provided under ATARS. The clear area represents our present ATCRBS set-up.



Midair Collision Avoidance continued

still going on before a sub-committee of the Committee on Government Operations in the House of Representatives. Based on progress to date, a national CAS standard and a working CAS of some variety are not envisioned until well into the 1980's. That brings up the question of "What is the USAF doing now in this field of midair collision avoidance?" The first area to be discussed is the more familiar Hazardous Air Traffic Report program with which all pilots should be basically familiar.

The HATR program, as established in AFR 127-3, dated 11 June 1976, establishes the system for reporting all near midair collisions (NMACs) and air traffic conditions considered to be hazardous. The responsibility lies with the individual crew member to report, in his opinion, any in-flight instance of a potential hazard resulting from:

- Air Traffic Control or services.
- Airspace management.
- Rules for the air.
- Traffic control and landing systems.

The HATR program, by regulation, requires that the information received from these reports be used solely for accident prevention, and not for any disciplinary actions. In fact, the program authorizes the reporting aircrew immunity from disciplinary actions. These reports should not be confused with the USAF Hazard Reporting System, covered by other regulations. HATRs are designed to identify, communicate, and hopefully correct any unsafe aspect of air operations.

Specific reportable conditions include items such as near midair collisions where an aircrew either had to take abrupt evasive action or would have to avoid a midair collision had circumstances permitted. Also included is a hazardous situation due to less than required separation between aircraft. Any communications or air navigation aids that contribute to hazardous situations are reportable as is any publication, directive, or procedure that could or did contribute to a hazardous air traffic condition. Personnel, facilities, and any other conditions that may constitute a hazard should be reported as soon as possible to both the controlling agency and a USAF safety officer. Look around. The HATR, AF Form 651, should be available at any USAF Base Operations or perhaps even in your mission trip kit.

The beauty of this program does not lie in the form or in statistical gathering function the program generates. Its benefit is that it is a true feedback system because each and every HATR submitted is investigated by the safety officer at the installation closest to whe the incident occurred. That safety officer will wo closely with the local USAF Chief of Air Traffic Co trol Operations (CATCO). The situation or hazard identified and discussed. The explanation and pr posed solution is communicated by message to t Directorate of Aerospace Safety and the Air For Communications Service, as well as the report ori nator's home unit.

The Air Force Inspection and Safety Center gath and tracks all HATRs. They ensure that the repo are routed through proper channels and compile a maintain a quarterly HATR Summary which is repr duced in the *USAF Safety Officers' Study Kit*. H they isolate and analyze cause factors as well as ident specific hazardous situations eliminated through HAT inputs and the resulting investigations.

The October 1977 HATR Quarterly Summary ide tifies environmental factors as the primary cause HATRs filed. Environmental factor is usually associat with near midair collisions which comprise 67 perc of the HATRs received. The environments most s ceptible to NMACs in order of greatest occurrence a

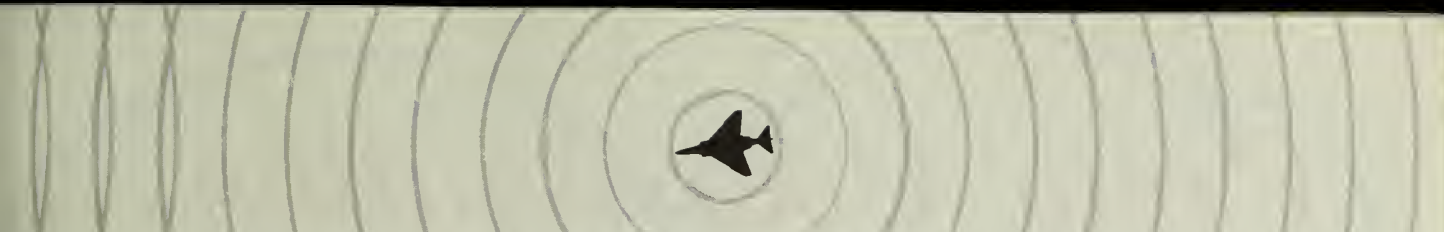
1. Airport vicinities, where non-controlled gene aviation conflicts with controlled approach and dep ture paths.

2. Military Low Altitude Training Routes, wh high airspeeds are required in areas frequented general aviation.

3. Overseas, where airspace and ATC procedu vary considerably from our US system.

Pilot factor was second among HATR causes w non-USAF pilot errors predominate. Air Traffic C trol Factor came next, in many cases due to syst overload and procedural or supervisory policies providing adequate relief. Pilot/Controller misund standing also produced a significant number of HAT The trend away from standardized ATC language a the use of colloquial or ambiguous terms has contrib ed to the problem.

The HATR program is an active entity that c tinually keeps the channels of communication o between users and operators of the ATC system. non-punitive guarantee encourages reporting of in dents, even by the person in error. The follow-up inv tigation, accomplished jointly by the USAF safety o cer and the CATCO, provides valuable feedback both controllers and pilots, and significant changes h taken place, reducing the potential for midair collisi and other hazards to air safety. Finally, the HA Summary advertises important lessons learned to



iits for the purpose of self-inspection of their present ocedures and practices. The story is still not complete. 1976, the FAA initiated another avenue for dis- mination of air safety hazard information called the viation Safety Reporting System.

One significance of the ASRS is the concept of using third party, the National Aeronautics and Space Ad- ministration (NASA), as the agency responsible for ceiving and analyzing these Aviation Safety Reports SRs). The program invites all users of the airspace stem to report to NASA actual or potential discrep- cies involving safety of flight operations. Like the ATR program, ASRS can only be successful with a e, unrestricted flow of information from the users the aviation system to NASA. For that reason, it is o non-punitive and in most cases, offers immunity participants. The third party concept was adopted to sure anonymity of the reporter and all persons in- lved in the incident, so as to encourage the free flow information necessary for the evaluation of the ef- iency and safety of the National Aviation System.

An ASRS advisory committee has been established NASA. It is comprised of representatives from the iation industry, consumers, the Department of De- ise, NASA and the FAA. The committee advises ASA on the conduct of the Aviation Safety Reporting stem. The reports received by NASA are promptly reened. Those containing time critical information on zards are forwarded to FAA, USAF or other inter- ed parties for their immediate attention.

Returning to the FAA waiver of disciplinary action, s provision is least understood and rarely utilized by litary pilots, but one form of protection airline car- rs and controllers use regularly. Let's say a pilot sses an altitude restriction due to confusion or mis- derstanding and this error results in less than stan- rd separation between himself and another aircraft. he files an ASRS report within 5 days (preferably mediately after the mission), he can gain immunity m violation by the FAA for not adhering to the triction.*

FAA disciplinary action, however, is not waived any case involving accidents or criminal offenses. lditionally, reports involving reckless operation, gross gligence or willful misconduct may result in disci- nary action but only on the basis of information ob- tained independently of the Aviation Safety Report. This waiver of disciplinary action, where applicable, covers all persons involved in a reported incident, not only the persons making, or named in an ASR.

The ASR contains a tear-off portion which includes information that identifies the individual submitting the report. This portion is removed by NASA, time stamped, and returned to the reporter as his receipt. This receipt provides the reporter with proof that he filed the report for a specific occurrence. NASA takes appropriate information dissemination action for the involved agency and then maintains a separate record of each report for 45 days following the incident. This data is retained in order to ensure the reporting individual receives the protection he is guaranteed under ASRS. When the FAA investigates an incident, it requests NASA to advise whether or not that incident has been reported. After a 45-day period, FAA can no longer initiate disciplinary action for an incident or an error.

The immunity aspect of the ASRS is one that all Air Force pilots should be conscious of. Don't lose sight, however, of the fact that ASRS was created to serve as a vehicle for the identification of hazards or potential hazards in all aerospace operations. It should be noted that the Air Force HATR program serves as an input to the ASRS, so duplication of HATRs and ASRs is not necessary. The filing of a HATR has the same effect as the filing of an ASR.

* * *

Midair collision avoidance is a multifaceted, important problem, yet the approval and acceptance of an automated collision avoidance system is not a certainty. Our purpose here has been to bring you up-to-date on the state-of-the-art developments in the hardware available to implement a functioning CAS. Just as important is the participation of Air Force people in both the HATR and ASRS programs. Significant achievements in midair collision avoidance have come about from these informative reports. CAS may be a solution of the future, but until such time as it is functional, aircrews must be especially alert to traffic conflicts and hazards. See-and-avoid is still the name of the game, and where errors or dangers occur, report them so that others can benefit from your experience.

Aerospace Safety magazine wishes to thank the editorial staff of *The Journal of Air Traffic Control* for permission to reproduce portions of their July-September 1977 article on ATARS. ★

iling of an ASR does not provide immunity from ciplinary action by the USAF for violation of USAF DOD directives.

Crew Coordination . . .
in the heavies

MAJOR JOHN D. WOODRUFF
Directorate of Aerospace Safety

We do not have additional copies of "Commandments," so those who wish t their own should reproduce them.

Coordination or cooperation, what difference does it make what we call it as long as we're communicating. However, there's a human tendency for people to try to run a one-man band. This is not what we want in crew coordination. Look at it this way. If the designers of a "heavy" had meant for the pilot to single-handedly fly the aircraft, they wouldn't have designed it with other crew positions. Or, the chief pilot in the sky would have made pilots with numerous sets of brains, heads, arms, hands, and fingers. Whether you're the pilot, copilot, navigator, flight engineer, bombardier, electronic warfare officer, loadmaster, or boomer, you all have a responsibility for crew coordination. There's just too much airplane in a "heavy" for one man to handle.

Look for ways you can help the other crew members. It's everyone's job to be involved. Of course, most of the big things get coordinated. But, the little ones can kill you too. Get involved in crew coordination!

MISSION BRIEFING TO DEBRIEFING

Crew coordination starts when we first report for the flight. If we don't start coordinating from the very start, we're asking for trouble. The crew briefing presents the first opportunity for crew coordination. Let's examine one particular phase of a mission to see how crew coordination is involved. Flight planning is definitely a place where two or more heads are better than one. The flight planning documents cover numerous details which might easily be overlooked by one pers but spotted and planned for by se eral. Remember, AFM 60-16 sa that, when the pilot puts his sign ture to the flight plan, it signif that:

• The flight has been prope ordered and released.

• Adequate flight planning da were available for complete and a curate planning.

• The flight will be conduct according to governing directiv

• The flight plan has been viewed for completeness and acc racy.

• Foreign clearance briefin when required, included the mi mum requirements of the Forei Clearance Guide (FCG).

• Each member of a crew or f mation flight was briefed on all pects of the planned flight and ea pilot member of the formation p sesses an instrument rating if a portion of the flight is to be co ducted under IFR conditions.

• He is aware of his responsib ity for the safety of the aircraft/f mation of aircraft and its occupan

As a "heavy" driver, if y haven't consulted numerous ot crew members, as an AC, you ha probably violated several of items listed above. This proc of crew coordination carries throughout the flight: prefligh ground operations, takeoff, dep ture, in-flight operations, bef landing checklist, approach, la ing, taxi and engine shutdown. yes, let's not forget the paperwo "No flight is complete until the

THE 10 COMMANDMENTS OF GOOD CREW COORDINATION

I Aircraft Commanders
THINK PEOPLE!
Remember you are working with people who have feelings of worth, need and dignity.

II Aircraft Commanders
SET THE TONE!
If you're the director of a one-man band, you won't foster much crew coordination. You, the pilot, set the tone of the crew. If you encourage and are receptive to an exchange of information, you'll probably get it. Also, let each crew member know what you expect of him.

III Aircraft Commanders
SOLICIT INFORMATION!
Ask for opinions or suggestions. It's not a sign of command weakness to ask what the other crew members think.

IV Aircraft Commanders
USE OTHER CREW MEMBER'S EXPERIENCE!
That old engineers probably has a lot of experience which can help you. Use it.

V Crew Members
DON'T BE SHY!
If you've got something bothering you, speak up. You may know something that someone else doesn't know.

VI Crew Members
BE PERSISTENT!
Keep the pilot and other crew members informed. Don't let one crew member snuff you out.

VII Crew Members
REMEMBER WHO'S IN COMMAND!
Make your input to the boss but remember he makes the final decision.

VIII Aircraft Commanders and Crew Members
BE TACTFUL!
Don't close the channels of communication in crew coordination through immature or unprofessional behavior.

IX Aircraft Commanders and Crew Members
REINFORCE GOOD COORDINATION!
When your crew flies a successful mission, it involves a lot of successful efforts by your crew and other support people. Reward people for special efforts with a thank you or a letter to their commander. Remember, a small "thank you" goes a long way with the other crew members and team players.

X Aircraft Commanders
DON'T SHIRK YOUR RESPONSIBILITY!
Think people; set the tone for crew coordination; solicit information; use experienced people; reinforce good coordination; BUT, remember you must make the final decision and be responsible for it.

erwork is finished." The aircraft rms, maintenance debriefing and perations forms all require a codinated effort.

EN COMMANDMENTS OF OOD CREW COORDINATION

There is no single piece of advice foster and maintain crew coordiation. But, here's a healthy stab at n of the more important ones. et's call them the Ten Commandents of good crew coordination.

IT'S A CREW EFFORT

We've seen how everyone is involved in crew coordination. Furthermore, we've clearly identified that crew coordination starts when we first report for the flight and doesn't end until the paperwork is complete. Lastly, we've discussed some useful tips (through the vehicle of the Ten Commandments of good crew coordination) to facilitate crew coordination. It's a crew effort, not just the pilot's responsibility.

All those folks on board are there for a reason—to help each other, perform a specific duty, and get the mission accomplished safely. Good crew coordination may make your next checkride a lot easier. I know it will help you perform better as a crew. Better yet, it may save your life! ★

OPS TOPICS

MILITARY TRAINING ROUTES

Beginning in early 1978, military flight training routes will start to appear on civil aeronautical charts. This change is part of a safety enhancement program aimed at keeping civil pilots better informed of military flight training activities. The charts will give civil pilots a greater understanding of military operations and enable them to plan and conduct their flights with increased safety.

BASE, GEAR CHECK . . . BEEP, BEEP, BEEP

An O-2A prepared for a no-flap stop and go. Upon reaching downwind altitude, the pilot hurriedly slapped the gear handle down. The handle, unfortunately, did not go to the full down position, leaving the gear up and the gear doors closed. Tapes from RAPCON indicate the gear warning horn was blowing when the pilot called, "Turning Base, gear checked." Meanwhile, back at the RSU, the observer recognized the gear-up approach and transmitted "Go around! Go around! Go around!" on guard. The O-2 pilot, however, had switched off guard earlier when guard transmissions had interfered with his primary radio communications. The RSU controller did not fire a flare because after his go-around call, the nose of the aircraft came up, and he thought the go-around was initiated. In actuality, the pilot was beginning his flare.

Checklist error + distraction + communication breakdown = accident. That's one lesson we still haven't learned. Break just one link in the chain and it no longer equals accident.

$10,000 CHAPEAU

Even at today's inflated prices, $10,000 is a lot of money for a flight cap. That's what a cap costs when it is recycled through a B-52 engine. The victim was engine number 8, immediately after termination of an alert exercise. The gunner completed his checklist items and received permission from the AC to depart the aircraft to help the crew chief exchange start cartridges. He positioned himself at the right forward side of the engine as the pilot was shutting it down. The flight cap was sucked in, damaging the first and second stage rotors. This crew member was keenly aware of the MAJCOM requirement to wear hats on the flight line but ignorant of the requirement that states hats or caps will not be worn in the immediate frontal vicinity of an aircraft while engines are operating. Commanders, operations officers, and aircraft commanders must ensure that the people realize the high cost and loss of combat capability associated with FOD incidents.

A FISH STORY

While trying to salvage a long, hot approach, the FAC pilot lowered the nose of his recip aircraft to counteract the ballooning effect. The nose wheel hit first resulting in a porpoise. On one of the forward bounces, the nose wheel tire failed, the propeller blades contacted the runway, and the nose gear fork assembly was bent. The pilot went around and recovered the aircraft safely. The moral is an old and tired one: The smart money does not try to salvage a bad approach—go around before the damage occurs and do it again; right this time.

OPS TOPICS

NEW PACIFIC AIR ROUTES

An experimental air route system which has increased both safety and capacity and also reduced fuel consumption on flights between Hawaii and the US mainland became permanent on December 1.

In essence, the new system increases the number of routes between the west coast and Hawaii from four to six by reducing the lateral spacing between routes from 100 to 50 miles. But, at the same time, it also requires a vertical separation of at least 1,000 ft between aircraft on adjacent routes.

FAA said this combination of vertical and lateral separation—called composite separation—is safer and more economical than the former four-route system which provided wider lateral spacing between routes but did not require vertical separation between aircraft on adjacent routes. The composite form of separation has been used successfully for years on flights over the North Atlantic.

Greater fuel economy is achieved under composite separation because it provides more direct routes and because pilots have a better chance of being assigned altitudes that permit the maximum jet aircraft performance.

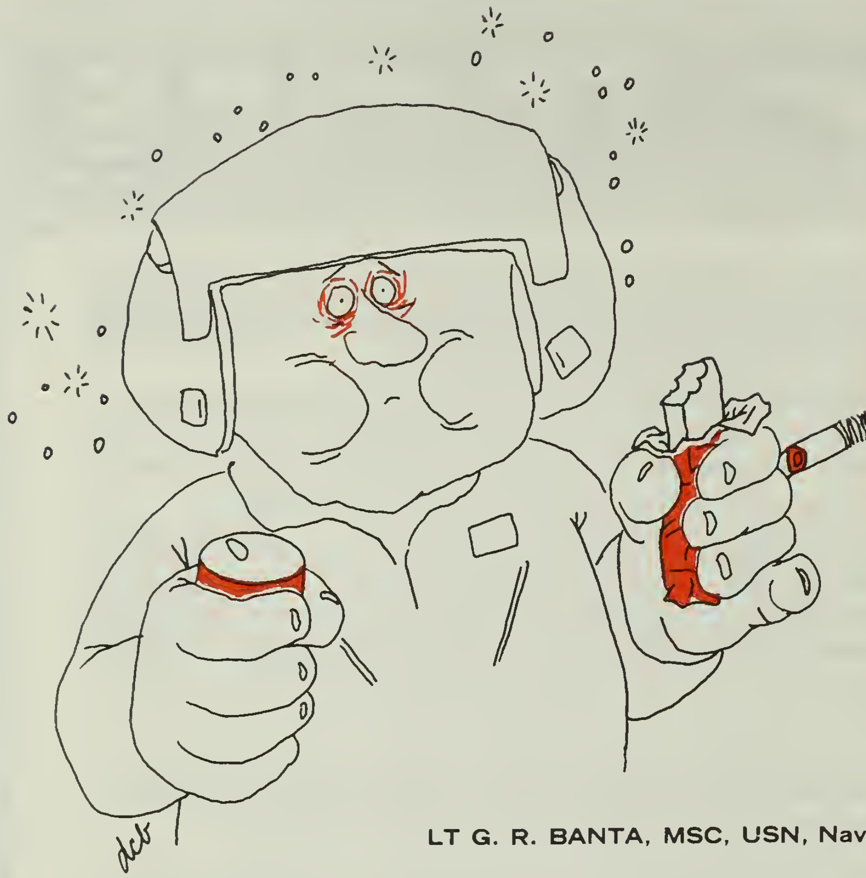
FAA said it will continue to monitor flights after the new system becomes permanent. Major lateral deviations observed by radar will be recorded and investigated to determine their causes. These findings then will be used to make any adjustments to the system that may be required.

TERMINAL LOW ALTITUDE WARNING

The new low altitude warning equipment is now operating at all 63 major civilian airports, according to the Department of Transportation. All airports with automated radar terminal systems now have the low altitude warning feature to tell air traffic controllers when planes are closer to the ground than they should be. The equipment, called the Minimum Safe Altitude Warning (MSAW) system, alerts controllers when aircraft equipped with automatic identity and altitude reporting equipment are detected at a potentially unsafe altitude in the airport terminal area. The alert comes in the form of a 5 second aural alarm and the letters "LOW ALT" flashed on the controller's radar scope. MSAW compares transponder altitude read-out to an altitude table programmed into the ARTS III computer.

"THE TAIL DRAGGIN"

First a C-130, then an F-15 and finally a KC-135, all were bitten by that monster the "tail draggin." Every year a number of Air Force aircraft are involved in mishaps in which exhaust nozzles, tail skids, refueling booms, etc., are damaged by contact with the runway. In most cases the cause is over-rotation. But there can be contributing factors. One mishap occurred because of the extreme runway slope. The pilot rotated to a normal pitch attitude and the tail hit. In another, the pilot flying the aircraft was set up for an over-rotation by the IP. He was simulating a nose gear failure landing and got the nose too high. Be alert and don't let the "tail draggin" get you. ★



The Fighter Pilot's Breakfast

LT G. R. BANTA, MSC, USN, Naval Regional Medical Center, Meridian, M

We in . . . aviation are concerned with many aspects of human factors, i.e., fatigue, smoking, drinking, insufficient sleep, psychological areas, etc. All these things clearly affect our performance. One area often overlooked, however, is nutrition. And proper nutrition and diet are critical in a demanding occupation such as aviation. To a great extent, we are what we eat.

But how many of us give much attention to nutrition? How many times have you rolled out of bed before the cock crows, looked at your sleeping wife (beautiful in her curlers and cold cream), dressed, and headed for the base with great anticipation of a succulent readyroom breakfast of coffee and doughnuts. Ah, yes, many times. In fact, if you were to reflect back on your typical day's diet, you would probably not see a gourmet's delight: coffee and doughnuts for breakfast; a bologna sandwich or chili dog for lunch (if time permits, that is). Too often, even this modest lunch is supplanted by a nearby candy machine. At dinner, we usually try to make up for the day's shortage by consuming a week's worth of fried chicken, mashed potatoes, and a dozen beers or the like. What contempt we must have for our bodies to give it this for energy!

Nutrition oversees all our basic functions: heartbeat, nerve sensation, muscle contraction, etc. To obtain our maximum daily performance, we should have a working knowledge of the daily inputs and outputs of energy. An additional benefit of this knowledge is the food money which can be saved.

When selecting food, it is easier to classify the basic food groups according to their equivalent nutritional values. This allows us to interchange these foods within each group to add variety in our diet planning.

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*Coke, candy bar, and a cigar

ESSENTIAL FOOD GROUPS:

1. Breads: enriched or whole grai cereal, or potatoes.
2. Citrus fruits, other fruits a vegetables.
3. Dark green or deep yellow veg tables.
4. Fats: butter, margarine, and oth fat spreads.
5. Meat: fish, poultry, cheese, eggs.
6. Milk.

The nutrient requirements for a given individual vary with his a and sex. Therefore, each indivi ual's diet should be tailormade that person's energy/output rat medical and physical condition, a it should be monitored continual

When we think about diet a nutrition, the term "calorie" is use The calories liberated after eati certain foods represent the amou of energy released into the body the food is broken down into va ious products. The average indivi ual receives approximately 15 p cent of his energy from proteins,

ercent from fats, and 45 percent rom carbohydrates, even though nore energy per gram is available n fats. As described in "Blood Fat nd the Fighter Pilot" (Sep '76 *Ap-roach*), when a greater quantity of ood (energy) is introduced into the ody than is expended, body weight ncreases. In fact, for every 9.3 cal-ries in excess of what is used, bout one gram of fat is stored. The xcess of energy storing occurs only vhen we are gaining weight.

To maintain a given weight, one nly matches his energy output with is input. So, if you are one of those ndividuals who says, "I hardly eat a hing, and still I can't lose weight," our energy output is less than your nput. You need to exercise more. UPERS Instruction 6110.2B has stablished standard height and veight statistics for the Navy, but he instruction also states that such tandards cannot be viewed as abso-ute for every individual. For ex-mple, an athlete may weigh more than allowable according to the table due to his high proportion of muscle tissue. Another individual may meet the standard weight, look trim, but still be in poor shape because of a high blood fat level and susceptibility to cardiovascular insufficiency.

If these exceptions do not apply to you, and your doctor decides you need to lose weight, what kind of diet should you go on? Many and varied diets exist—some with merit, some without. Whatever diet you decide on, it should meet the following guidelines:

- A diet must produce a negative caloric balance.
- A diet must contain a balance of required nutrients.
- The reducing program should produce a gradual weight loss (no more than 1 to 2 pounds a week). Medical monitoring is necessary for anything greater. Much of the weight loss on a semistarvation diet is quickly regained because it is not fatty tissue that is lost but muscle tissue or water.
- An exercise program should be a part of the reducing plan. Exercise helps build muscles at the expense of excess body fats.

One of the main problems of many fad diets that exist today is that they do not provide all the nutrients your body needs. *All* the food groups should be represented in a diet. A summary of the basic food groups and vitamins reveals why it is important that they be included in any diet.

Fats. Everyone needs some fats, but obesity and high blood fat levels are indicative of too much. In a daily diet, the amount of fat may hide itself. Fat doesn't dilute very easily, making it easy to store in the body, while carbohydrates and proteins mix readily into water substances that can be metabolized quickly. A single pat of butter may contain more fat-storing potential than anything else on your plate.

Table 1

Below is a table of vitamins and minerals that should be included in everyone's diet. Eating a well balanced diet should provide all these elements.

VITAMIN/MINERAL	FUNCTION	SOURCE
Calcium	Builds and repairs bones/teeth; muscle and nerve functioning; blood coagulation.	Milk, milk products, dark green and leafy vegetables.
Iron	Forms cellular substance that carries oxygen to the body.	Liver, meats, egg yolks, peas, whole grain and enriched breads.
Vitamin A	Night and color vision.	Liver, eggs*, vegetables, milk, butter.
Vitamin C	Cellular function; wound healing; blood vessel strength; formation of bones and tissue.	Citrus fruits, tomatoes, strawberries, broccoli, green, leafy vegetables, potatoes.
Iodine	Formation of thyroid hormone for metabolism of food and oxygen.	Saltwater fish, iodized salt.
Vitamin K	Blood coagulation.	Bacteria in large intestine.
Vitamin E	Protection of needed fat stores.	Balanced diet.

THE FIGHTER PILOT'S BREAKFAST continued

Carbohydrates. This category of food provides an essential energy source for the nervous system (brain). Foods of this category include cereals, fruit, pastries, and other sweets. Choose carbohydrates in your nutritional plan wisely because they convert to stored fat very easily. Because of carbohydrates' high energy content, they are essential in preventing fatigue, especially when the body is under a considerable workload.

Proteins. Every cell in your body depends greatly on protein because protein plays an important role in the structure of the cells and enzymes that regulate body processes. Just as fats and carbohydrates, proteins are used for energy; therefore, you must constantly replace these proteins to maintain their functions in the cell. We normally acquire proteins from grain foods, milk, milk products, meat, poultry, fish, eggs, dried beans, peas, and nuts.

There are two types of proteins. *Complete*, which are found in animal fodstuffs, that can be broken down and used by our body properly, and *partial* proteins, which are normally found in vegetables and grain foods and cannot be completely used by our body. Therefore, to maintain a proper protein balance when partial proteins are the main source, the quantity must be increased. If you have the ambition to be a vegetarian, you may wish to bear this in mind. If you fail to maintain your proper protein diet, you may notice lethargy, depressed mentality, and in severe cases, swelling, especially of the abdomen.

The vitamins discussed in Table 1 are also needed in a diet. However, it is possible to get too much of a nutrient. Large amounts of vitamins A and D, for example, can be toxic, as can an excess of many minerals, such as iron. Higher amounts of other nutrients, though not toxic, may result in "condition deficiency." In other words, the body may adapt to increased amounts of the nutrient and experience deficiency symptoms when only normal amounts are consumed. A balanced diet will supply the proper amount of nutrients without supplements. Table 2 presents a sample diet that provides balance without excess calories.

The fallacy that everyone needs vitamin supplements (pills) to obtain sufficient vitamin intake is but one common misconception of the public. Other misconceptions abound. A discussion of nutrition would not be complete without shedding some light on these pop lar but erroneous beliefs.

• *The primary source of musc energy is protein.*

If an individual is well nourishe protein is not the major source energy. The amount of protein nee ed is determined by the individua growth and increased muscle dev opment.

• *Fats, fried foods, and o dressings should never be eaten.*

The human body needs a certa amount of fat. The average Ame can eats a diet that yields 40 p cent of the calories from fat. In a dition to the fat-soluble vitam obtained from fats and the add taste they give to meals, fats ke you from feeling as hungry. On t

Here's a balanced menu representing the six food groups: vegetables, fats, fruit breads, meats, and milk. It is designed for an average-healthy aviator weighir 150-165 pounds.

Breakfast		**Calorie**
Orange juice	1 cup	80
Cornflakes	¾ cup	68
Toast	2½ slices	170
Eggs*	2	146
Butter	1 tsp	45
Cream	1 oz	77
Milk	1 cup	170
Lunch		**Calori**
Cheese	1 oz	73
Butter	1 tsp	45
Roast beef	1 slice (3" x 2" x⅛")	73
Bread	2 slices	136
Mayonnaise	1 tsp	
Celery and radishes	As desired	
Apple	1 small	40
Milk	1 cup	170
Dinner		**Calori**
Hamburger	2 patties (" diameter, ¼" thick)	146
Whole kernel corn	⅓ cup	68
Tomatoes	As desired	
Carrots	½ cup	36
Bread	2 slices	136
Butter	2 tsp	90
Plums	4 medium	80
Milk	1 cup	170

*NOTE: Recommended allowance of eggs is 3 per week due to high cholesterol.

Table 2

ering the intestinal tract, fat causes ne release of a hormone "entergas- one," which slows down the emp- ying of the stomach to the digestive rea of the intestine. Therefore, fat hould not be eliminated from your iet, but it should be restricted as a reventive measure against obesity nd coronary disease.

• *Since eggs are a good source f protein, you should eat a few ach day.*

One quality protein food need ot be emphasized over another. ggs are digested well in any form, ut because of current concern with holesterol and coronary insuffi- ency, you probably shouldn't eat nore than three a week.

• *Combinations of some foods ave special chemicals that burn alories faster.*

The grapefruit and egg diet does ot burn off fat. No combination in ood supplements assists the burn- g of calories.

• *Save your liquids until the eal is completed.*

It is not harmful to consume quids during the meal. It *is* harm- l to drink excessive amounts to ash down food without chewing it. ed liquids should be drunk slowly prevent interference with normal omach and bowel functions during od consumption.

• *Crash dieting is quick and ef- ctive in reducing.*

You may lose weight with this et, but you don't get the produc- ve nutritive supplements necessary r proper health. Loss will occur ot only in fat tissue but will in- ude needed proteins and muscle ssue. In addition, the body, due to slow adaptive methods, is apt to uickly regain the lost weight once e diet is removed. Sometimes, the eter ends up with even more eight than when he started!

• *Snacks should never be eaten.*

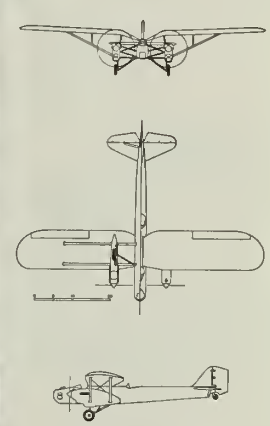
Eating between meals is not nec- sarily bad if extra calories are eeded to achieve daily caloric to- ls. In addition to providing energy, some snacks provide calcium, proteins, vitamins, and minerals which may be needed. But most snacks cannot be substituted for the six basic food groups needed in daily meals.

No article on nutrition would be complete without a discussion of that much debated question: Will you crash your airplane if you don't eat breakfast? Ever since flight school, aviators have had flight surgeons telling them the importance of eating breakfast. Several attempts have been made to correlate lack of breakfast with actual aircraft accidents.

While no conclusive evidence has been found to prove that lack of *Wheaties* causes accidents, a strong case can be built for eating breakfast. When you skip breakfast, fatigue and laxness hit late in the morning. The body tends to increase its fat stores after other meals to help compensate for the lack of energy during the hours of no food input. To be mentally and physically alert, you do need to eat some food early in the day to meet the body's caloric requirements. This doesn't mean you have to prepare a fancy breakfast with everything from juice to pancakes. A glass of orange juice, some milk, and an English muffin or toast with butter and jam will provide many of the food groups you need. In summary, something is better than nothing. But be careful of acquiring that dreaded aviator's habit—the "coffee — doughnut — readyroom" syndrome.

The benefits of good nutrition, along with proper body weight and cardiovascular conditioning, are a healthier, happier, and longer life. It can also make you a better and safer pilot. Your body is a precision, high-powered machine. Don't abuse it by giving it low octane food.—Courtesy *Approach*, USN. ★

Name That Plane



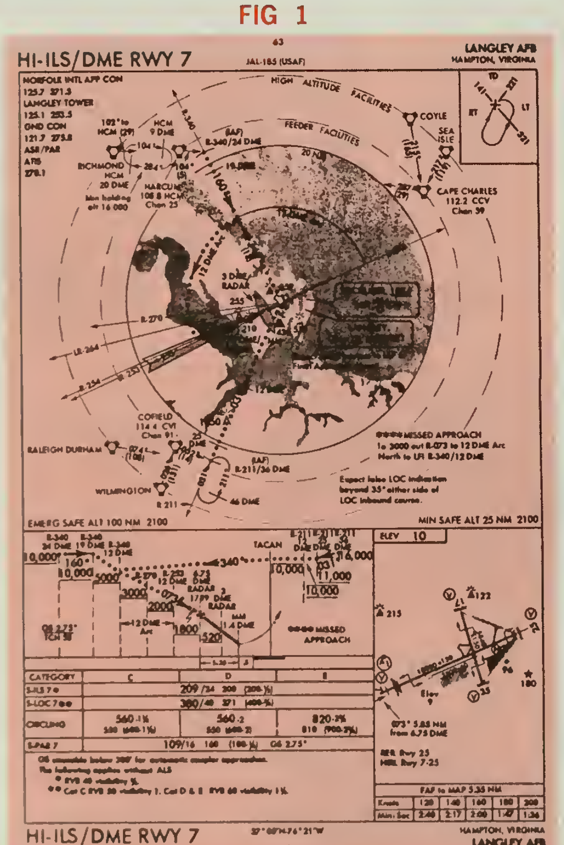
This early monoplane was a transitional product in the era of changing theories in aircraft design. The strength giving struts under the high gull wing make the aircraft look like a biplane with one wing missing. For the answer see Page 24.

USAF IFC APPROACH

INSTRUMENT LANDING SYSTEM (ILS)

Have you ever flown an ILS and noticed an "on course" indication when you were no where near the localizer? It can happen. Various types of antennas are used to obtain a directional signal for the front course. Beyond 35° either side of the front approach course, several false courses are possible due to lobing of the antenna signals. Let's look at an example. During the HI-ILS/DME RWY 7 approach into Langley AFB (figure 1), the aircraft is on the 12 DME arc to the localizer final approach course or on a radar base leg to the ILS final and is not within 35° of the final approach course. If false courses are pres-

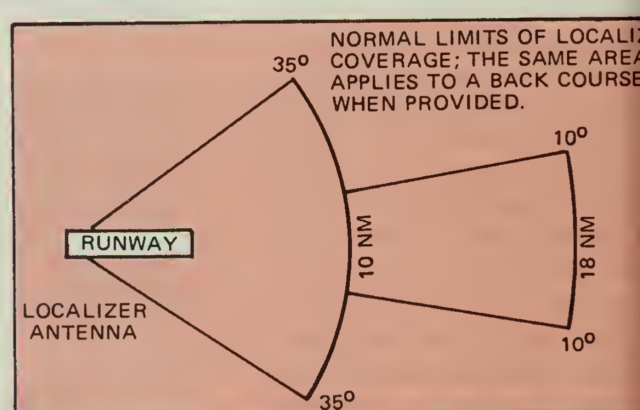
FIG 1



ent, with ILS selected, the Course Deviation Indicator will move back and forth across the case as the "false" courses are crossed (this phenomenon is similar to the false glide slopes which cause the Glide Slope Indicator to move from the top to the bottom of the case when going missed approach as each of these false glide slopes are crossed).

The Airman's Information Manual (AIM), paragraph 2e, under Instrument Landing System (ILS provides the following guidance on proper localize signal coverage area: "e. The localizer provide course guidance throughout the descent path to th runway threshold from a distance of 18NM from th antenna between an altitude of 1000' above the higl est terrain along the course line and 4500' abov the elevation of the antenna site. Proper off-cours indications are provided throughout the followir angular area of the operational service volume." " To 10° either side of the course along a radius of 1 NM from the antenna, and 2. From 10°-35° eith side of the course along a radius of 10 NM." " Proper off-course indications are generally not pr vided between 35°-90° either side of the localiz course. Therefore, instrument indications of possib courses in the area from 35°-90° off-course shou key you to the existing false localizer courses ar should be disregarded." (figure 2) Many pilots m have noticed recently that some ILS localizer fin

FIG 2



approach courses seem more sensitive than othe If the approach course is formed by a new So State ILS and the equipment serves a long runw the course width will be narrower and therefore mc sensitive than what we have been accustomed to the past.

Prior to solid state ILS equipment, military ILS calizer antennas normally formed a course with total width of 5°. Solid state ILSs are currently bei installed and use antennas which form a total cou

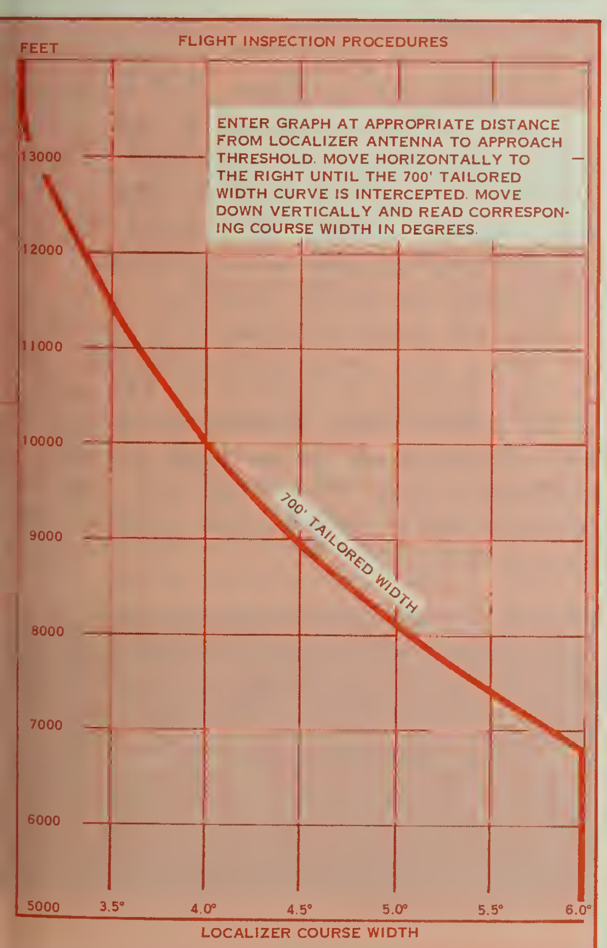
By the USAF Instrument Flight Center
Randolph AFB, Texas 78148

dth of from 3°-6° depending on the length of the nway (the longer the runway, the narrower the urse width).

What determines the tailored width of the new Ss? According to Air Force Manual 55-8, **United ates Standard Flight Inspection Manual,** "The optium course sector width of a localizer front course all be such that, at the threshold, the width of the ctor is 700', except that if compliance with this ecification would require either (1) a course sector dth exceeding 6°, in which case the course sector dth shall be adjusted to 6° or (2) a course sector dth of less than 3° in which case the course sector dth shall be adjusted to 3°."

For example, if we borrow the Tailored Localizer urse Width Chart from AFM 55-8 (figure 3) we d that if the localizer antenna is 1000 feet past e departure end of the runway, a 7100 foot runway

FIG 3



will yield a total localizer course width of 5° (1000' + 7100 = 8100'. Enter the chart with 8100', and carry across to the 700' tailored width baseline to yield 5° total width). Let's take an example with a long runway. An 11,000' runway with an antenna 1000' past the departure end, yields a total course width of 3.33°. This localizer course would be significantly more sensitive than a normal 5° course width. How does this affect the pilot? When intercepting the final approach course, if you have been using CDI "case break" as part of your intercept technique you may find yourself overshooting final unless you adjust to the faster than normal movement of the CDI. Also, when on final approach, deviations from centerline will be more readily apparent due to the increased localizer sensitivity and it may be more difficult to maintain CDI centered.

In summary, be aware of possible false localizer courses which are more common with solid state ILS systems, and be prepared to cope with more sensitive localizer final approach information, especially when flying into an airpatch with a long runway. As we have continually stressed in the past, and is now more important than ever, use whatever NAVAIDS are available to compute an accurate leadpoint to final, when possible, to ensure that each ILS approach will be successful.

REVISION OF PAST "IFC APPROACH" ARTICLES

One of the primary goals of the USAF Instrument Flight Center is to provide Air Force pilots with the most current information available concerning instrument flying and we use the "IFC Approach" articles extensively to accomplish this function.

Each year the Instrument Flight Center reviews past "IFC Approach" articles for currency. Articles considered current are those published after December 1974. Since many of our readers keep copies of our articles and use them as a review for instrument checks and also as teaching aids for annual instrument refresher courses, we publish this revision each January. A limited number of booklets of reproduced articles is available for distribution to those who wish to start an "IFC Approach" article file. A set of the articles will be mailed to you upon request. If additional copies are needed, they may be reproduced locally. Your request should be addressed

IFC APPROACH continued

to: USAF Instrument Flight Center/FSD, Randolph AFB, Texas 78148.

The following changes and deletions to previous "IFC Approach" articles should be made as indicated:

January 1975—Under the answer to the 1st question, delete COPTER VORTAC ARC 1.

February 1975—Delete 2nd, 3rd and 4th question and answer.

March 1975—Delete 1st, 3rd and 5th question and answer. Under REMEMBER, delete 2nd and 3rd paragraphs.

April 1975—Delete 1st question and answer. Delete 2nd sentence of the 2nd answer.

June 1975—Under answer to the 4th question, change (1000 feet ceiling and 3 miles visibility) to (1500 feet ceiling and 3 miles visibility). The answer to the 6th question should be changed to read: "A. Special VFR clearance should never be expected and an alternate course of action should be planned in case the special VFR clearance is not approved."

October 1975—Delete the entire article.

January 1976—Delete the 1st three paragraphs.

April 1976—Delete the 2nd question and answer.

July 1976—After the 3rd sentence of the 4th paragraph of the answer to the 1st question, add: "In congested areas, the bearing relationship may be altered for better portrayal."

August 1976—Delete question 10.

November 1976—Delete the 6th and 7th question and answer.

February 1977—Delete the 3rd item under significant changes to AFM 51-37.

September 1977—Under the answer to the 1st question, change, "1. The reported weather is below basic VFR minima (1000 feet and 3 miles)," to "1. The reported weather is below basic VFR minima (1500 feet and 3 miles). (NOTE: Controller training can be conducted as long as weather is at or above 1000 feet and 3 miles)." ★

NAME THAT PLANE ANSWER

Douglas B-7	Max range: 632 miles
Length: 46'6"	Service ceiling: 20,400
Span: 65'3"	Bomb load: 1,200
Gross Wt: 9,953	Armament: two .30 cal Browning guns
Crew: 4	
Max speed: 182	

WHICH ONE IS THE RUNWAY?

CAPTAIN PETER CONFORTI
San Antonio Air Logistics Center
Kelly Air Force Base, Texas

If you chose the lighter colored, longer pie of concrete, you are wrong! Look to its left f the real runway.

In the past 16 months at Kelly AFB, thr aircraft have landed on the parallel taxiway runway 15-33. All three occurrences involv experienced pilots. All occurrences were days in which the ceiling and visibility were u limited with the pilots visually acquiring wh they thought was the runway 15 to 20 miles o

These landings occurred in spite of: (large block letters with the word "Taxiwa painted on both ends of the taxiway, (2) ca tions depicted on approach plates and in t IFR Supplement and (3) a statement on t ATIS pointing out the hazard.

With all these warnings it is obvious th the pilots were complacent and either did get the message or ignored it. The next ti you're cross-country, landing at a strange fie take advantage of all the flight planning a available to you. They could save you emb rassment and an unwelcomed meeting with t base commander. ★

NEWS FOR CREWS

Information and tips to help your career from the folks at Air Force Military Personnel Center, Randolph AFB, TX.

CAPTAIN ROGER ROSENBERG
Fighter/Recce Career Management Branch
Air Force Military Personnel Center

IGHTERGATOR" CAREER MANAGEMENT

If there were space to use only one word to de-ribe the environment the fighter weapon systems icer (WSO) faces in tactical fighter and recon-issance worlds over the next few years, the word uld be "dynamic." This dynamism in the Tactical Force (TAF) has been characterized in the recent st by the SEA drawdown, F-4 wings deployed into llis and Hill Air Force Bases, and the move of an 11 wing to the United Kingdom. To these actions ıst be added the onset of the F-4G and the im-ıding conversions of many F-4 units to new and en single-place aircraft. In spite of these conver-ns, however, there is today a shortage of WSOs to et force requirements.

E TAF WSO SHORTFALL—PAST, PRESENT, D PROJECTED

In the late 60's the decision to place navigators two-place fighters resulted in an increased re-rement for WSOs. Since the requirement could be met immediately, the force faced a shortage the outset. Building an inventory of WSOs as well meeting other navigator requirements necessitat-a large undergraduate navigator training output, l Air Training Command produced new lieutenant vigators at high rates during the build-up. By 73, the last pilot systems operators had departed rear cockpit of the F and RF-4.

Although two-place fighter requirements have be-n to decline, the impact is different than most Os expect. As noted above, the force remains in a ortage position. The five year defense planning. ogramming and budgeting cycle is geared on the sonnel side to procuring and training sufficient Os to meet requirements at the end of the five r defense program (FYDP), in this case FY 1983. e present shortage will reduce slightly each year, will continue through 1983, eliminating any need flow large numbers of WSOs into other weapon tems.

Additionally, transfer of some F-4s out of the ac-e inventory has not taken place as planned, and as a result, the shortage that was expected to decline each year may actually grow slightly in some years of the FYDP.

WEAPON SYSTEMS

Within the WSO world, several systems should be discussed. The declining requirements we have been discussing so far represent the F-4. In its various models and modifications, the Phantom II has been the backbone of the tactical fighter and reconnais-sance forces, and will be so a bit longer. As the only major multi-purpose fighter, it is projected to remain a part of the active inventory well into the 1980's.

The F-4G WILD WEASEL begins coming on board late this year, but will not replace the F-105 or F-4C WEASELS for several years (the fighter electronic warfare officer will be the subject of a future article).

The F-111 requirement is not declining, and is ex-pected to remain a major part of the fighter force for the forseeable future. Some flow from the F-4 force to the F-111 has existed, permitting a healthy infu-sion of tactical high performance experience into this critical system. The cross flow may increase as the EF-111 comes into the inventory.

REQUIREMENTS, PRIORITIZATION, AND OPPORTUNITY

It has been clear to this point that there are insuf-ficient fighter WSOs to meet all fighter requirements. Since there is a shortage, these requirements must be prioritized, and this prioritization will be impor-tant in viewing career opportunities.

The flying force, logically, must have top priority, and it is important to note that since this includes training the flying force, RTU IWSOs are part of this top priority. Just below the flying force is the specific fighter staff arena—those positions usually identified by AFSC 2255X that require experience in tactical fighter or reconnaissance aircraft. One level below this is the rated supplement surge consisting of a small number of WSOs in support duties who could be returned quickly to operational duties in the event

of a contingency. Other areas include ATC Instructor duty, general ops staff, and the supplement drawdown. It should be noted that the staff positions include wing, numbered Air Force, and major command, as well as Air Staff/joint staff billets, which provide significant broadening and management opportunities while meeting core fighter requirements. It is also important to remember that WSOs are serving as flight commanders, operations officers, and squadron commanders in the tactical environment.

Other areas often associated with broadening for the individual Air Force officer must be manned at lower levels in view of the overall shortage. The rated supplement represents, in terms of quantity, a relatively small area. While it is certainly a part of the fighter requirement, not all officers can serve in this area. WSOs can compete for in-residence professional military education and to a lesser degree, AFIT.

In summary, then, what has been presented is d signed to give you a basic idea of where the "fight gator" force is and where it's headed. This is no catalog of what's available or a "how to" primer career development. What we have done is to prese a context or framework into which you may wea your own personal desires, situation, and goals. T single major point is—that due to the shortage a the general trend of rated authorizations, the figh WSO, as all rated officers, should prepare to co pete in the operations arena. ★

ABOUT THE AUTHOR

Captain Rosenberg is a graduate of George Washington University. He is a former F-4 WSO who has been assigned to the Fighter Assignments Section o the Rated Career Management Branch, AFMPC, for the past 2 years.

EUROPEAN WEAT

LT COL HELMUT OBERBRINKMANN, GAF, Directorate of Aerospace Safety

One of the biggest question marks in a pilot's job is the weather. He never knows when it will be his "friend" or his "foe." Some fighter crews, particularly those from Southwestern US bases operating for the first time in the European area, must feel like gamblers with the odds stacked against them, i.e., strange environment and bad weather as well. In this article, bad weather means low clouds, heavy rain, snow or gusty crosswinds on wet runways.

In the European theater, particularly between October and April, you will find as "normal" a combination of bad weather and darkness nearly 80 percent of the time. This is the condition that NATO Forces face when they participate in exercises and in which they may have to fight some day should NATO deterrence break down. Therefore, peacetime training for weapons delivery such as that provided by "Red Flag" exercises, instrument training, and weather flying, become critically important. Based on my experience, I can promise a big surprise is in store for many pilots from the US when they find themselves transferred to a European base either for deployment or PCS. Clear skies and unlimited visibilities become a rare event.

The German Air Force (GAF) has a lot of experience in this weather and has identified it as a "problem area" for young fighter pilots returning home after receiving their training in Texas, Ariz or California. The problem is, arrive home without enough exp ence in bad weather and canno transferred directly to an operat al German tactical fighter wing. GAF has developed a color co system (see Chart) to ensure p are not put into weather situat beyond their capabilities. Each or code indicates a level of ficiency and currency in instru flying. It also shows the appropr weather minimums for approa and landings. The code values respond to the field weather co tions.

CHART

Blue: Visibility not less than NM and ceiling not l than 2,500 ft/AGL.

R CAN BITE YOU

en: Visibility not less than 2 NM and ceiling not lower than 700 ft/AGL.

ow: Visibility not less than 1 NM and ceiling not lower than 300 ft/AGL.

ber: Visibility not less than 0.5 NM and ceiling not lower than 200 ft/AGL which is in general also PAR-minimum.

pilot not proficient in instrut flying or who hasn't flown for riod of 3 months or more, car- the individual color code e." After some supervised train- with an instructor pilot, and in- ctions in instrument approaches, vill be upgraded step-by-step. If lot does not have at least one tice instrument approach in any month, he drops back to the next higher minimum color code.

GAF fighter pilots not current in the European environment and European air traffic rules and regulations must take a special familiarization course with at least 45 flying hours (instrument, bad weather operations, day and night flights) before they can join a tactical fighter wing.

After having passed this course, the requirements for the individual color code "green" are fulfilled. Further upgrading will then be done within the tactical fighter wing.

As I mentioned before, European weather conditions become a serious problem to USAF pilots as well particularly those from US bases with generally good weather. We don't want to lose a pilot or an aircraft just because his proficiency in low visibility or low ceiling approaches was not quite good enough.

If it is true that about 60 percent of all tactical aircraft assigned to AAFCE are US Air Force aircraft, then the proportion should increase to 80 percent when US-based reinforcement aircraft arrive. Thus it is essential that commanders place strong emphasis on realistic training and attention to their units' instrument proficiency. The risk has to be carefully calculated if those combat-ready crews with little weather experience are to successfully merge into other NATO units and immediately begin to operate under WX minimums of the European hosting air force. Should that become necessary, good instrument pilots will have taken the bite out of European weather, especially at night. ★

WHO SAYS I CAN'T KILL YOU

AVOID MY ENVIRONMENT

CAPTAIN WILLIAM J. ELY, JR.
Area Commander, Recruiting Force, Eugene, Oregon

I feel that I should warn you before it is too late. This article represents a betrayal on my part and seemingly classifies me as a traitor to my own kind, but I still question whether or not it truly represents a substantial reduction in odds, giving you the distinct advantage. This depends on your attitude and how seriously you interpret what I am about to say.

My skin is colored. As an individual, I alone possess the potential strength of inflicting serious injuries or—more than likely—killing you. Associated with others like me, our combined strength is unbreakable. Our growth during the past decade has been phenomenal. We have literally spanned almost every portion of the globe. As we continue to grow in both size and number so, proportionately, does the power that surges through us. We are too well established. We have existed too long already and will be around for centuries to come, so it is inconceivable that we will ever be eliminated. But, our growth and strength are only two of the advantages we possess.

We are inconspicuous. Our camouflage is natural. We have the peculiar advantage of being able to blend with almost any type of background. At night, we are invisible to the eye. Be it as it may, however, most of our victims are snared during the daylight hours. We rely on the element of surprise, our encounters being sudden, violent and devastating. Hardly aggressive, we prefer to wait in ambush, striking when you least expect it.

Finally, we possess a unique characteristic of reproduction. Any time one of us is torn down or destroyed—within days our damages have been repaired and we are generally much stronger than before. Fortunately for you, however, our replacements are much more recognizable.

As a rule, I and others like me prey on the naive—the uneducated. If you feel that you fall into this category, then you will probably literally run into me sometime. It is unfortunate, for I and other strands of wire too often are writing obituaries.—Courtesy US Army Aviation Digest ★

☆U.S. GOVERNMENT PRINTING OFFICE 1978 789/855/53

Captain James F. Kendrick Captain Raymond G. Henley

3d Tactical Fighter Wing (PACAF)

›n 27 January 1977, Captain James F. Kendrick Captain Raymond G. Henley were flying a night air eling and air defense intercept mission in an F-4E ıumber two in a flight of four. On climb out, Cap- Kendrick noticed a slight problem with pitch sen- ity. As the climb continued, pitch responsiveness 'eased, and by level off at FL 200 it was apparent the flight would have to be aborted. The lead ele- ːt turned toward home declaring an emergency.

'he emergency quick release paddle switch and stab- switches were cycled to attempt to isolate a pos- ɜ stability augmentation malfunction. Increased ‹ stick pressure was required to maintain straight level flight, and full nose up trim was not adequate elieve the back stick pressure at 300 KIAS. All cir- breakers were verified in, and the pitot heat was ıecked on. Several checks were made to verify that hydraulic systems were operating normally.

rior to descent through an undercast, a controlla- y check was performed, and gear and flaps were ɜred. As the flaps came down, needed back stick ːsure lessened, but pitch responsiveness continued leteriorate and the stick became difficult to move. ɜn the aircraft slowed below 185 KIAS, the nose ɪn to pitch down and the aircraft began a descent that could not be corrected by full aft stick. Airspeed was increased using power, and an absolute minimum of 190 KIAS was set as the final approach airspeed. Over 200 KIAS, the aircraft would climb.

As the aircraft descended, control stick stiffness increased. The flaps were raised to increase stabilator effectiveness but pitch response did not improve, so the flaps were lowered again. Meanwhile, preparations were completed for a controlled back seat initiated ejection.

Turns to final were made with rudder, as Captain Kendrick could no longer move the stick with one hand. A departure end cable engagement was planned because of the uncertainty of the touchdown point. A PAR was flown controlling the aircraft exclusively with thrust and rudder. A successful night landing was accomplished, and the aircraft stopped prior to the departure end cable.

Captain Kendrick and Captain Henley demonstrated superior airmanship and exceptional skill in recovering a valuable Air Force aircraft. Their quick assessment of a rapidly deteriorating situation, decisive plan of action, and excellent crew cordination led to a well flown night approach and landing using only thrust and rudder. WELL DONE! ★

DEPARTMENT OF THE AIR FORCE

MCMXLVII

UNITED STATES OF AMERICA

aerospace

SAFETY FEBRUARY 1978

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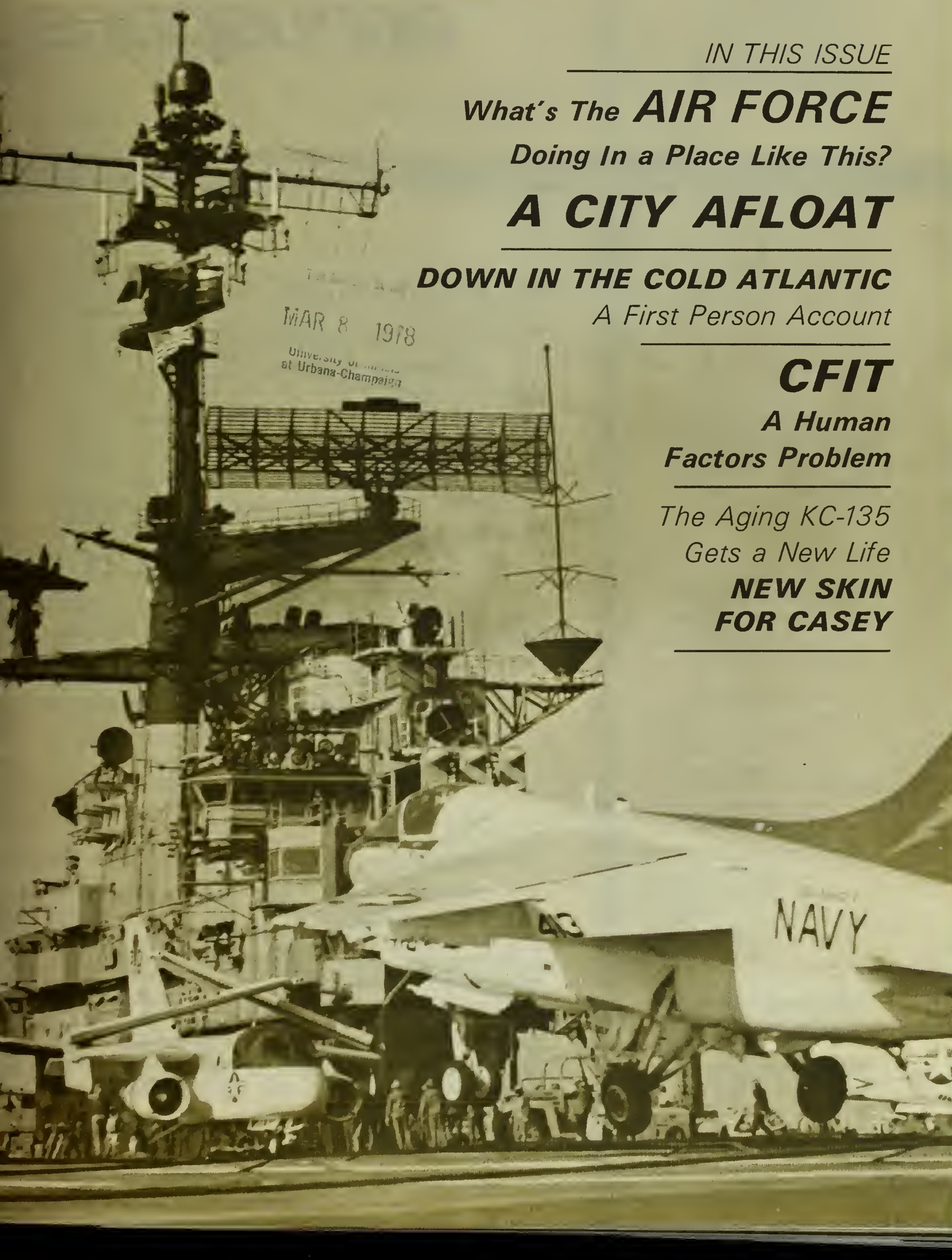
NEW SKIN FOR CASEY



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REGULAR FEATURES

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FEBRUARY 1978 AFRP 127-2 VOLUME 34 NUMBER

"Mais Ou Sont Les Neiges D'Antan?"*

With apologies to Francois Villon

s I grow older I find myself thinking more and more of "How it used to be." A sign of roaching senility? Could be. way, an article in the 4 Nov- er 1977 *TIG Brief* by Major eral (Richard E.) Merkling ed my memory bank. Perhaps recollection is worth passing on.

1958 I was assigned to a two dron F-100 wing being formed lisawa AB in northern Honshu, n. We were replacing the last ght wing HOGS (F-84s) in the e force. Coming from Nellis, e and Victorville, as most of us the transition was a real ker. At the start, there might been a half dozen pilots in the le wing with 500 hours in the V (F-100) and, with the excep- of the HOG pilots, probably with real winter flying experi- in any bird. Added to the l difficulties of mastering a new ons system were the year- d fog and the winter snow. did it snow! Sixty inches the year, a staggering 220+ es the second year and, if I ll correctly, about 100 inches e third year.

he winter weather posed a real lem to our inexperienced h, since there was no really ble weather alternate to Mi- for the HUN. Chitose, 125 orth on Hokkaido Island was lly worse than Misawa when- the snow and fog rolled in. ota, 320 miles south, was gen- y out of the question as an nate because of fuel require- ts. Accordingly we usually forced into landing where we off—at home plate. The HUN ormed well at Misawa, the low eratures assured that. Getting

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*But where are the snows of yesteryear?

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the bird stopped on 9,000 feet of wet runway at best and hard-packed ice and snow at worst while maintaining directional control at the same time was another story.

An easy solution to our problem might have been to stand down from November to March. But this would never have been acceptable to our hard nosed air division commander, an old SAC type BG. So we learned to cope with the winters. With remarkable results I might add, for during the three winters I spent there we never had a HUN in the barrier, even with a no-chute.

The snow removal people were good but there was no way that they could keep the runway completely clear. To help them and us, a relatively simple procedure was devised. The first flights of the day, to include the F-101 and F-102 squadrons, took off down wind if the tail wind component was not too bad. That usually cleared at least half of the active runway of the snow and ice the plows had missed and provided reasonably good braking action on landing rollout. This little trick undoubtedly helped us stay off the barriers those first three winters. And yet staying out of the net didn't always work year-round.

For too many of we HUN drivers a no-chute in summer (there wasn't much spring and fall at Misawa) was followed shortly by the explosion of the pylon cartridges cleaning off the stores and the radio call, "barrier, barrier, barrier." Either that or hot brakes in the de-arm area. It probably happened at least monthly. Got expensive too. Some of you are saying "Why . . . ?" You thinkers already have the answer. It was our attitude, of course. In the winter we worked harder; we flew more hours than in the other seasons but our attitude changed. Jocks tried harder to fly the right air speed, land at the right point, and in the right attitude. We anticipated the no-chute and mentally planned our landings as if the barrier would not work when needed. We knew all too well that if one of us tied up the runway by engaging the barrier the rest of the flight was in a real world of hurt. Unfortunately, that attitude, like the long johns we wore, seemed to come off when the snow melted.

I would not argue that we were the best HUN outfit ever, or the only fighter squadrons to fly under severe weather conditions. We *were* good, and for me it was a proud three-year association. We also had our share of dumb, pilot-error accidents. Which brings me to the point.

Wouldn't you agree that if we all applied the same attitude to all our flying, year-round, as our bunch did toward winter landings at Misawa, some good friends, yours and mine, would be around to have their memory banks jogged too? General Merkling would agree. He was an F-101 driver there at the time.

How's your attitude? Seasonal or year-round? ★

PAUL M. DAVIS, Colonel, USAF
Assistant to the Commander for Quality Assurance
Oklahoma City Air Logistics Center
Tinker AFB OK

CFIT

A Human Factors Problem

MAJOR JOHN E. RICHARDSON
Directorate of
Aerospace Safety

An airliner on an approach to a familiar airdrome crashes into a mountain 25 miles from the airport.

An Air Force transport on approach to an Air Force base crashes 29 miles from destination.

An F-4 crashes in an open field 13 miles short of the air base.

In each case the aircraft was operating normally. The crews were not incapacitated, and the weather was not a factor. Yet without warning, each of these aircraft descended below a minimum safe altitude and crashed.

These are three examples of a type of accident which the NTSB has labeled "controlled flight into terrain" (CFIT). While not strictly defined, the concept behind this term is an aircraft in normal flight without emergencies, and with no warning to the crew, flys into the terrain or water. The definition includes a wide range of mishaps —climbs as well as descents. But it does exclude those where some external force such as severe weather or equipment malfunction is causal. Examples of such exclusions are the Eastern Airlines 72 which crashed at JFK after e countering severe windshear ar downdrafts from a thunderstorr or the T-38 in which the ailer connector failed in flight causir the aircraft to go out of control.

The CFIT mishap is particular disturbing because it should l preventable. The problem is find the key. The aviation world replete with attempts at solution radar altimeters, coupled a proaches, GPWS, Mode C, et Some of these mechanical fix have been fairly effective; the co mercial carriers have not had CFIT mishap since FAA mandat fleet-wide installation of a GPW However, the mission, flight ope ations and environment of US flying is often different from th

xperienced by commercial car-
iers. This plus the distinct human
lement intermingled in every CFIT
ishap makes it extremely unlike-
/ that any single piece of equip-
ent will be a universal cure-all.

Flying today is a complex busi-
ess. And this complexity has
reatly increased the mental effort
equired of the crews. Research-
rs in engineering psychology
ave found that sustained mental
ffort decreases performance just
ke physical work.

Since there are no mechanical
ailures associated with CFIT mis-
aps, we must look elsewhere for
nswers. The complexity of flying
nd its effect on people is a good
lace to start.

In its early days in aviation,
uman factors or human engineer-
ng, as this study of the man-ma-
hine interface is called, was pret-
y much relegated to cockpit de-
ign and crash survival efforts.

More and more attention is now
eing focused on the problems of
uman reliability and perform-
nce. Data from the studies made
y psychologists on work performance in ground jobs can be applied to flight. In fact, the problems become more acute because in flight the performance demands are more critical and the margins for error much less. For example, the level of demand on a pilot for a typical flight can be roughly plotted:

The demand levels for other complex airborne tasks like air refueling, ACM, or ground attack are comparable to that for approach and landing. A curve plotted for mishap experience looks very similar.

The conclusion that mishaps occur when demand on the pilot is highest is certainly not earth-shattering. These times are the so-called "critical phases of flight" when the margin for error is small-

FIGURE 1

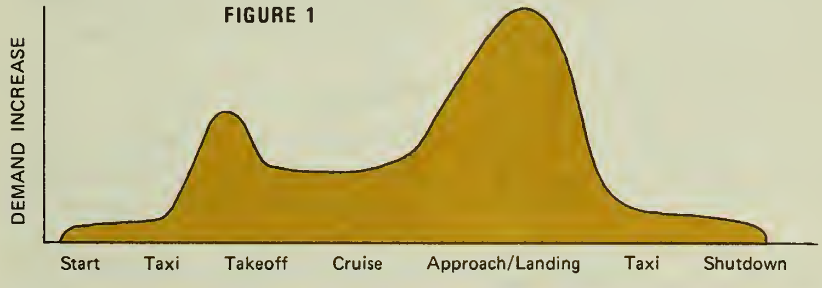
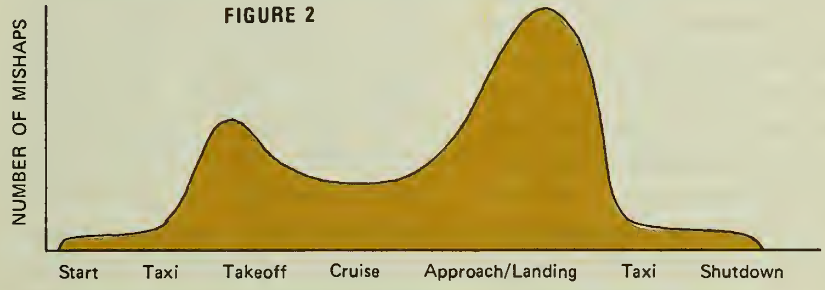


FIGURE 2



est. This is precisely why we need some knowledge of human factors which can reduce this margin even more.

AROUSAL AND STRESS

By arousal we are referring largely to stimulation which contributes to the general physiological and behavioral "alertness" of the individual. There is an optimum range of stimulation. Within this range the individual is capable of performing at maximum efficiency. The problems occur when stimulation is beyond the optimum range. Then the level of alertness and arousal is affected. If stimulation is too low, boredom sets in and leads to inattention and low sensitivity to stimulus. Any pilot who has flown a long night mission knows the effects of low stimulus levels. And it is entirely possible that such low arousal could lead to an accident. A commercial airliner over the Atlantic experienced an autopilot disengagement. The aircraft entered a slow spiraling descent unnoticed by the crew and ultimately lost 30,000 feet before the crew recovered.

On the other end of the scale over-arousal or extremely high levels of stimulation can lead to hypersensitivity, loss of muscular control, and, ultimately, total disorganization in responses. This form of over-arousal is most common in jobs requiring rapid performance of highly complex tasks under hazardous conditions (e.g., aircrews or air traffic controllers). Flight instructors frequently encounter this situation with students just learning a new task.

A KC-135 launched on a standard refueling mission. The instructor pilot and upgrading aircraft commander were flying. To accomplish a required training item the flight directors were in gyro mode for takeoff. This was not the normal mode so this placed additional demands on the student. Shortly after lift-off the aircraft developed a directional control problem. The IP concluded that nr one engine was failing and reduced power to get a relight. This action increased the drag, and the aircraft rolled rapidly to the left. The IP tried to take control, but the pilot in the left seat did not relinquish control. The resulting over-controlling, as both pilots attempted to correct, caused the aircraft to lose flying speed and crash one-half mile past the departure end of the runway.

FATIGUE

Fatigue can be defined as a state whereby a crew member has feelings of inability to perform, an aversion to the task at hand, or a lack of interest in the situation. Fatigue is a progressive condition. At moderate levels a pilot or aircrew member can cope with fatigue and still perform satisfactorily. However, as fatigue increases, the finer distinctions of judgment are lost and the potential for mishaps rises rapidly. Fatigue has played a part in many Air Force mishaps. Usually we talk of lack of crew rest or excessive cre[w] duty time. These are the deficie[n]cies, but the real cause is fatigu[e]. Crew size doesn't matter; the tw[o] most recent mishaps in this are[a] involved a fighter and a larg[e] transport.

The fighter crashed on a TACA[N] approach at home base after [a] weekend cross-country. The inve[s]tigators discovered that the cre[w] had not ensured they had ad[e]quate crew rest during the wee[k]end. It is probable that fatig[ue] contributed to a crew error resul[t]ing in impact with the trees 1½ miles short of the runway.

A transport struck a mounta[in] some 17 hours after the cre[w] started their duty day. Once agai[n] fatigue contributed to an err[or] which led directly to the misha[p].

STIMULUS AND RESPONSE UNCERTAINTY

The more certain a person [is] about the events occurring an[d] what the response should be, th[e] better he performs. For exampl[e] if a pilot is unfamiliar with an ap[]proach his or her attention [is] channeled to the approach pla[te] details. This means that there [is] less capacity to deal with aircra[ft] control radio transmissions, et[c]. When the pilot is uncertain abo[ut] the situation, bad weather, aircra[ft] emergencies or unusual circum[]stances, there is hesitation in re[]sponding or even inappropria[te] responses. The problem of hab[it] pattern interference can occur: A F-4 pilot who, in the confusio[n] before an ejection, raised the gui

tine handle instead of the ejec-
n ring. He had reverted to his evious aircraft experience where e armrests contained the ejec-
on triggers. Sometimes a pilot unwittingly placed in a position here his or her capacity for re-
oonse is exceeded.

Shortly after lift-off a flight two fighters entered weather. umber two was not very experi-
ced in weather formation and st lead in the departure turn. e was unable to transition to in-
ruments, became disorientated d crashed.

ASK INFORMATION ROCESSING LOAD

The human mind can only grasp finite amount of data at a given me. Once the volume of data put exceeds the brain's capacity r processing, some information ll be selectively discarded. What ems are discarded depends on imerous variables—the internal iority system of the brain. the tensity of the stimulus, etc. The oblem is that the information ocessed by the brain may be ss important than that discard-
l. The other aspect of this situ-
ion relates to factors discussed rlier—arousal, fatigue, and re-
onse uncertainty. As the factors ceed optimal levels, the ability the brain to process data is fected. This means that highly mplex or extremely rapid deci-
on-making becomes very difficult stress increases.

An Air Force bomber was mak-
g a non-precision approach to home base. The weather was deteriorating, and the command post had suggested the possibility of diversion. On the approach the aircraft descended below MDA and crashed 3 miles from the end of the runway.

Half a world away a flight of fighters was weather recalled to their home base. Lead attempted to make a visual approach in very marginal weather; and in the final turn the aircraft entered a heavy rain shower. Witnesses saw the aircraft come out of the shower in an extreme bank angle and steep dive. The pilot attempted recovery but was unable to complete it before ground impact.

These are not the only human factors problems in aviation. Cockpit design, lighting, visual display, noise and vibration levels are all important considerations. However, these are of more concern to engineers and designers. The items discussed in this article are the ones which apply to all aircraft. Further, solutions to these problems often are accessible to units or aircrews rather than just to designers. For example, fatigue can be countered by adequate crew rest and careful crew scheduling. True, there are very explicit directives on crew rest, but in the past three years at least three fatal mishaps have been directly attributed to crew rest violations.

Obviously, something more than directives is needed. Here is where operations supervisors need to carefully examine crew scheduling. Also, what is the unit policy and practice on crew rest on TDY? One of the crew rest mishaps occurred during TDY.

Uncertainty about the proper response and too much information input to be handled completely are two problems that can quickly complicate an already critical situation. In flight this can occur when pilots and crews are faced with complex and confusing data sheets or checklists which must be accomplished during critical phases of flight. A common item which can be very confusing is the low altitude approach plate. Very often the mass of data printed on that plate makes it almost impossible to decipher the proper course or could cause the crew to overlook the information because it is too difficult to process. Training is an important consideration here. A crew familiar with the approach or procedure will need to expend less mental effort. But, designing checklists, approaches and procedures as simply as possible will do much to reduce the uncertainty and also the processing demands.

There is no simple solution to CFIT mishaps nor to human factors problems. But, we can give human factors the broad effort it so richly deserves. And when we address the "people" side of the accident question with something approaching the precision we devote to the mechanical problems, we will have a major stride towards correcting the knotty CFIT mishap. ★

SNAKEBITE . . . . Ho Hum

CAPTAIN HOWARD R. ALLEN
Training Development Branch, 3636 CCTW (ATC), Fairchild AFB, WA

"Survival School, Sergeant Rugged, may I help you, sir?"

"Yes, please, I'm in charge of continuation training for my outfit, and I need some information on snakebite. Can you help me?"

"I think so, what exactly do you need?"

"Well, . . . I thought I'd hit 'em with some real scare stories —you know, that one and two stepper stuff, to get their attention. Then I'll hit 'em with the old cut-and-suck method. Do you think I ought to have a live demonstration? For realism, you know!"

"I see. Why are you making such a big deal over snakebite? Do your students need this training?"

"They certainly do. The jungle and desert are full of those nasty critters and besides I have to make the briefings interesting."

"There are plenty of dangerous snakes in the world all right, but I think you're letting folklore and superstition guide your thinking."

"But what about the millions of people all over the world who are bitten each year?"

"Did you know that only about 3 percent of those are fatal? And here in the US only 10 or 12 out of 8,000 bitten by venemous snakes actually die. And incidentally, up to 95 percent of the survivors received no first aid treatment at all."

"That's very interesting, but what do I do if one of the thousands of rattlesnakes that live in our training area bites me?"

"Your chances of dying from a rattlesnake bite are about one-third less than they are for dying from a bee sting. If you don't sweat the bee sting, don't sweat the rattlesnakes."

"Oh sure, it's easy for you to quote statistics, but what do I teach my people? They want to know the proper method for treating snakebite. How far do I make the cut? Where do I put the tourniquet? How do I . . . ?"

"Whoa, hold on there, slow down, you are getting excited, which is exactly what you should avoid in case of snakebite. Shock quickened by fear and panic, is probably a greater enemy than the bite itself. Keep the patient quiet, reassure him he is not going to die, and you will do mor good than if you whipped out yo survival knife and began to cut on him. In fact, if symptoms do not occur, or are mild, in the firs 3 to 5 minutes following the bite, complete immobilization and sterilization of the bite area may be the only treatment needed."

"But there must be a standardized medical treatment for snakebite. Why, it's . . . it's the Air Force way."

"We can find medical opinion supporting different points of view, but before you, an unqualified amateur, employ any cutting tools on yourself or a buddy, I urge you to consider the damage you might cause, using a treat-

nt that may not be needed at Excessive bleeding from the e wound and infection from blade or the sucking mouth cause even greater problems n the bite itself."

Are you telling me there is ing I can do to help my poor ke-bitten buddy?"

I think a better idea is to cate him in the classroom to inate the mystique surrounding these creatures. Let him know safe he is and you eliminate of the enemies of survival—fear. Do this and he will be less likely to panic or worse yet, surrender to the enemy just to get out of that snake-infested jungle or desert. Let me put it this way. Are you a gambling man?"

"Well, I've been known to wager a buck or two on a game of chance."

"OK. Let's play the odds. You are a survivor on the ground, and rescue is not immediately available.

• The odds are you won't even see a snake. The snake will avoid you. You can help by using care where you put your hands and feet. Avoid wood piles and rubbish heaps where snakes may be hunting rodents.

• If you do see one, it probably won't be poisonous. In the US only 10 percent of the species of snakes pose a danger to human life.

• If it is poisonous it probably won't attack you unless forced to by you.

• If it does bite, venom may not be injected. Defensive type bites, unlike bites to kill for food, inject little or no venom. No poisonous snake in the world is looking at you as a seven-course dinner.

• If it does inject venom the odds favor your survival even if no first aid is given at all.

"In other words, if you see a snake, don't figure on **him** biting you, figure on you biting **him** . . . for food. If you don't need the food, leave him alone and he'll go home. Have I convinced you that you need have little fear of dying from snakebite?"

"Uh, I guess so . . . but what if . . . ?"

Questions or comments concerning this article should be referred to 3636 CCTW/DOTO, Fairchild AFB WA 99011, or AUTOVON 352-5470. ★

The dangers of snakebites are normally overestimated by the average person. A calm, level-headed approach is what is needed.

NEWS FOR CREWS

Information and tips to help your career from the folks at Air Force Military Personnel Center, Randolph AFB, TX.

MAJOR JAMES L. HOBSON, JR.
Chief, Tactical Airlift Career Management Team, Air Force Military Personnel Center

The career opportunities in today's airlift systems are virtually unlimited. An individual can progress from squadron level through MAJCOM, Air and Joint Staffs in such specialties as tactical and strategic airlift, rescue, weather, special operations, and special missions, just to name a few. The continuing goal of increased force stability will produce longer tours in the operations field, a general rise in experience levels, and the opportunity for valuable experience and increased responsibility.

Training costs have risen drastically in the last few years. Pilots who have been out of the cockpit can expect shorter requalification courses based on their experience and time out of the weapon system. To further reduce training costs and maintain necessary experience levels, most rated officers can realistically expect to remain associated with one weapon system world (e.g., tactical airlift, strategic airlift) throughout their careers. Assignments may consist of aircrew duty, wing/NAF/MAJCOM staff tours; operational commands, and general ops staff positions throughout the Air Force. Opportunities for career broadening assignments in the supplement, PME and AFIT, will remain but in fewer numbers than in the past. Most of the supplement requirements will be in technical career fields.

CURRENT ITEMS OF INTEREST IN AIRLIFT ASSIGNMENTS

ATC IP Requirements: The airlift systems have a requirement to support the ATC/IP force with approximately 75 inputs in FY78. This is a challenging opportunity to fly another aircraft and at the same time impart some airlift experience to our new pilots. It's a 4-year controlled tour offering instructional and staff experience, with return to your airlift weapon system upon tour completion. Apply via AF Form 90.

Navigator Manning: There is a projected shortage of airlift navigators for rated duties in the spring of 1978. This is a result of reduced UNT production, delayed INS conversion and an overage in the rated supplement. To help alleviate this shortage, many majors and lieutenant colonels will be returning to operations as their normal supplement tour ends. While entry into the supplement will be reduced, approximately 75 airlift navigators per year will be selected on a best qualified basis for suppleme duties. Application is also via Form 90.

C-5 Force Management: C-5 pilot entry prereq sites have been expanded. Pilots with a minimum 1600 hours total time are eligible to apply. Prior will be given to junior officers. Based on flying hou training limitations only a small number of sel pilots can be accepted. Selected officers will atte the 9-week C-5 qualification course at Altus AI Oklahoma, with a final assignment to either Tra or Dover AFBs. Interested officers should apply AF Form 90.

C-9 Force Management: We have aeromedi airlift C-9s stationed at Clark, Scott and Rhein M AFBs. Pilot inputs for C-9s come from UPT, f assignment IPs (FAIP) from ATC, rated officers w no weapon system identity and finally, previou experienced C-9 pilots. Generally speaking, pil who have major weapon system identity (all mo C-130s, C-140s, C-141s, WC-135s and C-5s) are currently eligible for C-9 training (89th MAW cluded). Most C-9 pilots can anticipate a minim of two tours in the aircraft prior to any broaden assignment outside the weapon system.

Assignment Timetable: Officers completing ov seas assignments, HQ AF controlled tours, and ra supplement tours are screened for reassignmen months prior to PCS movement. After resource m agers make appropriate comments relative to fut utilization, all records are reviewed by a board senior officers. This board determines whether next assignment will be to rated or non-rated dut The board meets approximately 8 months prior your move. It is imperative that we know your sires and future plans before the board conve The AF Form 90 is the proper vehicle to trans this information. For assignment purposes, we sh have a copy of your Form 90 no later than 10 mo prior to your tour completion.

We make every effort to match your next ass ment with the preferences you've outlined on y Form 90. Should you have questions regarding y Air Force career, feel free to call your Wing Ca Advisor or the career managers at AFMPC. You reach the Tactical Airlift Team on AUTOVON 4 4951/3332 and the Strategic Airlift Team on AU VON 487-4961/3140. ★

OPS TOPICS

EARLY INDICATORS OF A PROBLEM

On initial takeoff, the C-130 IP stated the aircraft seemed to be nose heavy. About an hour and forty-five minutes later, the IP noticed the student pilot's performance seemed to be deteriorating. The IP took control of the aircraft and discovered the elevator control was extremely stiff. Five degrees of nose up trim was required to relieve the heavy stick pressure. After a controllability check and isolation of the elevator boost pack the controllability problems were relieved. An uneventful landing was made at home station. Watch those early indicators—they are trying to tell you something!—Maj John D. Woodruff, Directorate of Aerospace Safety.

JUST A LITTLE OFF THE TOP, PLEASE!

In two separate instances, F-100 aircraft nearly had close encounters of the hard kind (contact) with trees. The first was on a TACAN approach, in rainshowers, approximately two miles from the runway. The pilot thought he had good visual references with the runway using runway lights and VASIs. He departed the MDA and descended into the tree tops, one mile short of the runway. His go-around was successful as was his subsequent controllability check and full stop landing. The other pilot was momentarily preoccupied with an airspeed deviation while on a low level ingress sortie, approximately 100' AGL. The aircraft dipped down and to the right and before the pilot could recover, the right wing trimmed the top off a 45' tree. He also recovered safely. Both are very, very lucky pilots.

FORMS FOD

The care and feeding of an F-15 engine does not include AF Forms 781. In fact, they will give the engine a $182,000 bellyache. That's exactly what happened recently when a 781, inadvertently left in the nose gear well, entered the engine as the gear was retracted after takeoff. The pilot reviewed the forms, then left the area. The crew chief replaced the forms in the nose wheel area, a local procedure not used at the pilot's home station. Neither remembered them later on when the aircraft was started. Could this happen to you? Think about it.

TELL SOMEBODY!

A USAF aircraft had a near midair collision (NMAC) with a light aircraft. The pilot landed and filed a HATR. The identity of the civil aircraft was never determined. If you experience a NMAC, TELL the controller about it and tell him you are going to file a WRITTEN REPORT after you land. That verbal report initiates the investigation and alerts the controller to try to identify the other aircraft if possible. We are NOT trying to get a violation against the pilot. We are trying to find out WHY he did what he did.—Maj Joseph R. Yadouga, Directorate of Aerospace Safety.

HOW TO SOLVE AN ATC DELAY!

A Sheik's aircraft was given a 4-hour delay for departure from Heathrow, England. The Sheik's pilot called the tower and said, "The Sheik would like to know the reason for this delay." The tower controller replied that the delay was a result of "a strike by the ATC assistants at West Drayton Center." About 5 minutes later the Sheik's pilot again called the tower and stated "The Sheik would like to know how much West Drayton would cost." —Courtesy *Crosscheck*. ★

LT JEROME L. PETYKOWSKI
VC-2

The author, a Navy pilot, was forced to eject over the Atlantic 30 miles off the coast of North Carolina in December 1976. This is his first hand account. We are reprinting it here for the lessons learned value to USAF crews.

I was scheduled as a backup target tow on a routine air-to-air missile firing exercise. Unless my services were needed, all I would have to do was fly up and down the coast in a standby status. So, early that morning as I dressed for the event, I toyed with the idea of not wearing the bulky, restrictive CWU-33/P ventilated wet suit. The last few days had been warm for December, and although the water temperature was 50°, the air temperature had been a bit warmer. Besides the normal clumsiness and discomfort, wearing the suit meant that I would be unable to reach the upper ejection handle if anything did happen. In the end, however, common sense prevailed. I complied with SOP and donned the wet suit.

After checking in with GCI, I established myself in the prescribed holding pattern. I was flying alo
—fat, dumb, and happy—when
quick succession, I noticed a brig
red and white flash to my righ
heard a loud explosion, and felt
tremendous push forward. Th
flight controls and UHF were in
mediately inoperative, and th
plane began to spin inverted. I w
in a poor ejection position—off th
seat and nearly pinned against t
canopy. Because of the tremendo
negative G forces, however, the
was no way I could better it.

After attempting several Mayd
calls, I reached for the lower eje
tion handle and attempted to pun
out. Unfortunately, I did not have
firm grasp on the handle, and m
hand slipped. The second time,
made sure that I had a good gr
As I yanked the handle, I tried
throw my body back to get so
sort of acceptable ejection positio

In a flash I was out of the a

ıft and spinning violently as I ex-
rienced seat-man separation. The
xt thing I remember was that I
s perpendicular to the risers,
tching the parachute canopy de-
oy. I saw the spreader gun fire
d the canopy blossom. The open-
shock knocked the wind out of
. Once I was able to clear my
ad, I tried to assess my situation.
elt OK, but was still trying to re-
n my breath.

Looking straight ahead, I saw an
craft in a nose-low, left-wing-
wn attitude. At first I thought it
s my A-4. Then I realized that it
s not on fire and was afraid that
ad panicked and punched out of
alvageable aircraft. Once I was
e to focus my eyes, I realized it
s not an A-4 but an F-4. Al-
ugh confused, I was relieved to
that he was coming back to
cle me. I attempted to contact
Phantom via my PRC-90 sur-
al radio. I could hear some stat-
but was unable to receive any
ce transmission. After making a
ıple of calls to let them know
t I was OK, I began prepara-
ns for water entry.

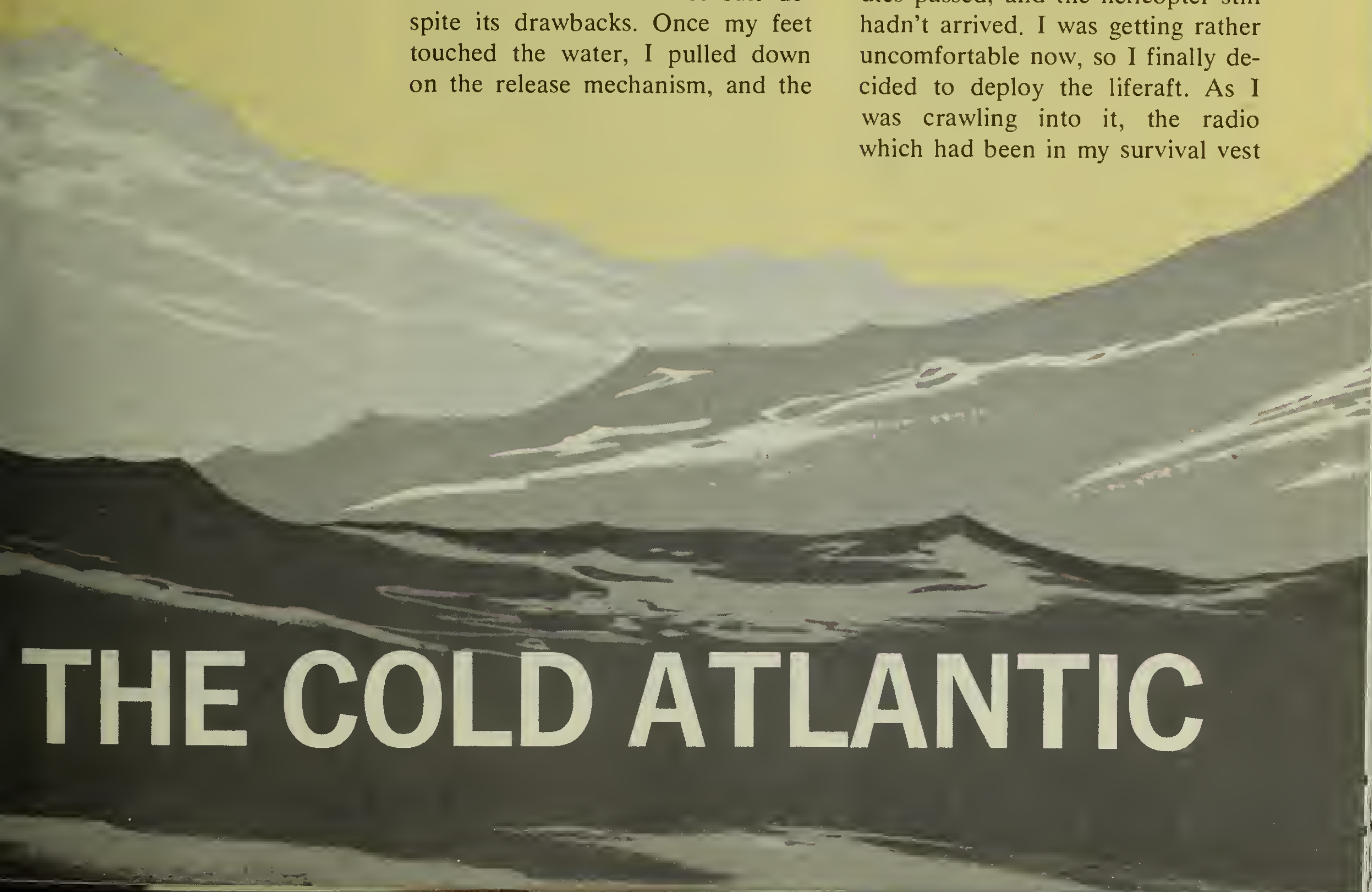
I replaced the radio in my survival vest pocket and inflated my LPA. It worked as advertised, although the right side of the collar failed to inflate fully due to the restrictiveness of the Velcro tape. As I reached back to loosen it, a shot of pain went down my neck and back. For the first time, I realized that I had been slightly injured during either the ejection or the parachute opening.

With the LPA inflated completely, I reviewed my survival procedures for water entry. I decided against deploying my liferaft at that time because the CWU-33/P made even the slightest movement seem like a Herculean task. I decided that as long as my LPA was inflated, I'd have plenty of time to deploy the raft once I hit the water. I then checked for the Koch fittings and found them easily within my grasp. I realized, however, that I still had my gloves on. I stowed them in my survival vest and again reached up and put my fingers near the opening of the release fittings. As I drifted down through a solid undercast and toward the black Atlantic, I thanked God that I had decided to wear the wet suit despite its drawbacks. Once my feet touched the water, I pulled down on the release mechanism, and the chute drifted away about 20 feet behind me.

Once in the water, I took out my radio to contact the Phantom which had been circling me on the way down. I still didn't deploy my raft because I was confident that I'd be picked up soon. The Phantom pilot obviously had a good fix on my position and was probably radioing it back to the SAR helicopter. Besides that, I had expended quite a bit of energy because of the wet suit, and I felt exhausted. I decided to lie in the water and rest until I could again catch my breath.

After about 10 minutes, the Phantom left but was almost immediately replaced by a C-130 which I spotted approaching my position. He was proceeding directly toward me, so I called him on my radio. As he passed over, I called again to give him an "on top" call. As he turned away, I figured that he would circle my position until the helicopter arrived.

Little did I know at this time that no one was reading me nor did they have me in sight once I entered the water. I was just a black spot in a black ocean. Five or ten more minutes passed, and the helicopter still hadn't arrived. I was getting rather uncomfortable now, so I finally decided to deploy the liferaft. As I was crawling into it, the radio which had been in my survival vest



THE COLD ATLANTIC

Down In The Cold Atlantic continued

somehow slipped free and fell overboard. I had not ensured that it was attached to my vest by a tether line. I felt sick that the radio was gone, but cheered myself with the thought that the SAR helo would be there very soon.

As time passed, I could not understand what was taking so long. The seat pan had an emergency beacon, and I was sure that everyone would home in on that. I had also dispensed some green dye marker, so I also had a constant visual marker in the water.

I noticed several aircraft in the area, generally circling my position. I attempted to get their attention with my pencil flares, but this seemed to have little effect. I realized I had to make myself more visible, so I reached into my survival vest and took out my strobe light. I pushed the button; it worked for about 20 seconds and went out completely. I always carry two strobe lights, so I was not too worried as I pulled out the second. I became concerned, however, when it failed to work at all. Aircraft—C-130s, H-1s, and H-46s—were continually passing either over my position or within a mile and a half of it, and I could not attract their attention!

By this time, I had been in the water for an hour and was becoming rather anxious. I could not understand why none of the aircraft made an effort to rescue me. I began to think that I might have had a midair and the SAR efforts were being concentrated on the other crew. I still had no idea what had caused my plane to explode and crash.

Finally I noticed an H-46 coming almost straight towards me. It was no more than 100 yards away and approximately 200-500 feet off the water. My hopes soared as I took out a smoke flare to attract his attention. By the time I had popped the flare, the helicopter was nearly abeam of my position. My confidence took a nosedive as I watched him continue toward the coast without acknowledging my signal.

I now became very concerned that things just weren't right. Another 20 minutes passed before a Coast Guard C-130 flew directly over me. I tried to signal him with a pencil flare—again to no avail. At this point, my confidence was at its lowest. Despite all my efforts, no one had spotted me, and I couldn't understand why. I could see the C-130s and H-46s conducting their expanding square search pattern approximately 5 miles to the southeast of my position. I was becoming very cold by this time, but I refused to let myself think of what would happen if they did not find me soon. Instead, I took an inventory of my remaining signaling devices and planned how best to use them once another opportunity presented itself.

Two hours had gone by since I had entered the water when a Marine C-130 passed directly over the top of my raft. I fired another signal flare, but again no acknowledgement. Then it occured to me that, although the liferaft was br orange and should have been ea visible, my flight suit was dark the ocean, and my body was co ing most of the orange raft. I rolled the orange edge flaps began to wave them. The plane gan to circle my position, an thought that someone had fi sighted me. I heard an H-46 c ing and shot a flare directly in f of its path. I was overjoyed w the pilot initiated a hovering toward me. I popped the night of my flare to help him with wind direction and waited unt lowered the horse collar. I abandoned the raft, swam to harness, and was lifted aboard helicopter.

It was not until later that that I found out the full story. F-4 that had originally spotted had me in sight until I hit the ter. Once I released myself the chute, I became virtually of my surroundings. The Pha was low on fuel, so it was fo to return to base prior to the C arriving on station. Although C-130 crew had a TACAN tion, they were too high to se in the water. In effect, I wa visible. Since I had lost my vival radio, I could not co them verbally nor could I us emergency beacon. The radio i seat pan worked for only 15 utes before it too succumbed t elements. For 2 hours I was and the SAR people had on general idea of where I was. only reason the H-46 finally sight me was by pure chance. pilot in the right seat happen look in my direction and sav

ting in the ocean. They never any of my flares or other signs.

ooking back on the experience, ould like to offer some conclusions and recommendations. The t important and vital point that like to pass on is the importance hat antiexposure suit—provid- it's on your back rather than on anger in the paraloft. It is very sible that I would not be around ay to write this article had I not n my CWU-33/P. I don't like ring "the bag" any better than body else, and I could have ra- alized not wearing it because I "within gliding distance of l." But look how far my A-4 ed with a Sidewinder up its tail- ! Anybody that doesn't comply the letter and the spirit of the ° combined sea/air minimum perature rule is literally betting life that his airplane is going to e it back. Personally, I like liv- too much to make that bet.

ther comments I'd like to pass

My complacency in thinking my exact position was known ed me to delay my actions in emergency. My strong advice is to delay your survival proce- s when faced with any type of rgency situation. Use every ns available to you in order to d your discovery and ultimate ue.

I carried two packs of pencil s with me and used most of n during my time in the water. s to find out later that although flares are easily sighted at night, they are difficult at best to see in the day or in poor visibility.

• The strobe lights should have been of much greater value to me. However, despite a recent 90-day survival vest inspection, the batteries were weak enough to go dead once they were exposed to the elements. In this case, I suggest that the Navy revise its standards as to what determines satisfactory battery performance or find some other, more reliable, power source.

• The green dye, although highly visible during bright sunshine, was virtually useless because of the overcast sky that prevailed during my excursion in the Atlantic. Not exposing the orange raft flaps could have been a contributing cause in my delayed rescue. Another way I could have increased my visibility would have been to use the orange-colored side of the solar blanket provided in the seat pan survival kit. By cutting a hole in the center large enough to slip my head through, I could have worn the blanket—serape style—thus offering a large orange target for the SAR crews to spot.

• During the initial portion of my experience, I tried removing my helmet in order to relieve some of the weight. As soon as I lifted it from my head, I felt an icy rush of air pass over my scalp. I realized then that the helmet was helping me to conserve precious body heat, as 75 percent of one's body heat can be lost through the head. I kept it on the remainder of my time in the water. Also, during my ride up the rescue hoist, the helmet served me once again by protecting my head when I was summarily lifted into the underside of the H-46. If I had removed it, I'm sure I would have received a painful souvenir of my first helo ride.

• I now carry the large antiexposure mittens that I had previously thought too large and cumbersome to carry with me in the A-4 cockpit. Although my Nomex flight gloves somewhat shielded my hands from the wind, the insulated mittens would have afforded me infinitely better protection against the elements. Toward the end of the 2-hour ordeal, my hands were numb and I was having difficulty manipulating the signal flares. If my rescue had been delayed much longer, I'm sure I would have lost the dexterity necessary to use any of the rescue devices.

• Finally, eat the Charm candies provided in your survival kit. Sugar is energy. Energy provides strength and warmth, both of which are highly desirable in a cold weather survival situation.

My purpose for writing this article has been to share the knowledge I gained from my survival experience so others might avoid the pitfalls I fell into. A cold water survival situation is not pleasant, and preparation and advance planning are the best lifesaving techniques you can employ. I sincerely hope that no one reading this article ever finds themselves in a similar situation, but if they do, I just hope that they have prepared themselves. Believe me, the Atlantic Ocean in December is totally intolerant of complacency and unforgiving of error. —Courtesy *Approach*. ★

NEW SKIN FOR CASEY

LT COL CHARLES L. MILLER
Oklahoma City Air Logistics Center
Tinker AFB OK

The C/KC-135 aircraft, which was designed during the early 1950s with a 10,000 hour design life, entered the USAF inventory in 1956. During its 20-year life, the -135 fleet has compiled some impressive statistics. Of approximately 750 aircraft remaining in service, over 100 have flown in excess of 10,000 hours, over 30 have exceeded 15,000 hours, six have exceeded 20,000 hours and the three highest time aircraft have accrued slightly over 25,000 hours. The -135 fleet as a whole has accrued in excess of 6.3 million flight hours without a single aircraft loss attributable to wing structural failure!

This impressive record is the combined result of the damage tolerance or "fail-safe" design concept and an active USAF/AFLC structural integrity maintenance/modification program. A "fail-safe" design is one that can tolerate the localized failure of one or more structural members without a significant reduction in the residual strength of that structure (i.e., it consists of adequate redundant load paths to carry the stress into the adjacent structure).

The -135, being of a semi-monocoque design, provides over 50 percent of the wing strength through the wing skin. This skin, on the production aircraft, was constructed of 7178 aluminum alloy which was selected for its extremely high strength-to-weight ratio (the highest of the aircraft aluminum alloy family). However, in more recent years, it has been recognized that 7178 aluminum has very low fracture toughness (i.e., it is very "brittle" under cyclic loading stresses).

Throughout the history of the -135 fleet, the Air Force through AFLC, has spent millions of dollars testing, evaluating and modifying the -135 structure to maintain its structural integrity. The most recent effort is through a program to replace the brittle and aging 7178 aluminum lower wing skin with an improved design skin construct of highly fracture resistant 20 aluminum (TCTO-989). Howev the magnitude of replacing the low wing structure on a 750 airpla fleet will mean that this retrofit w not be completed on all aircra until 1988.

To enhance the aircraft structu integrity for those aircraft yet to ceive TCTO-989, several modific tions have been developed over t past several years. The purpose this article is to provide advanc crew familiarity with one of the modifications, the acoustic cra detection system (ACDS) prior its introduction into the -135 fle

WHY AN ACOUSTIC CRACK DETECTION SYSTEM?

To maintain a high degree of *f safe* in the aircraft wing, (as co structed with 7178 aluminum), is imperative that wing skin pa cracks of intermediate size (one six inches) are detected *when th occur*, so that they can be repair

rior to subsequent flights. If cracks e allowed to go undetected, subquent high stress levels (due to gh gross weights, maneuvering id/or gusts and the weakened ructure) will cause the cracks to n farther until an entire skin nel is broken from edge-to-edge. omplete panel failure (edge-to-ge), based on engineering analy-, can reduce the residual strength the wing, depending on location, 60 percent of design limit load, less, and will greatly increase e potential for catastrophic wing lure.

In the wing area, outboard of the selage, the -135 design incorpoes a "wet wing." Therefore, a ack in this area will likely be deted on the ground by visible fuel epage or leaks. In flight, a severe ack in this area will be detected the crew through a loss of fuel antity and by visible vapor trail-from the area of the crack. owever, the center wing area (in-ral to the fuselage) fuel is conned in bladder cells and the low-wing skin is not readily visible ground inspection because of the uipment bay, the air conditioning cks and the keel beam doors.

To provide an early warning of a ck condition in the *center wing a*, ACDS has been designed and ted and will be installed on all KC-135 aircraft until such time t the lower wing skin is replaced der TCTO 1C-135-989. (The ck detection system is not re-red after wing reskin with frac-e resistant 2024 aluminum alloy).

IEN WILL ACDS BE INSTALLED?

The first aircraft with ACDS CTO 1C-135-1026) installed, will pear in the January 1978 time iod. A full scale installation pro-m averaging 40 aircraft per nth will be initiated in February 78 and fleet-wide retrofit will be npleted by September 1979. This allation will be done on aircraft are captive in depot mainte-

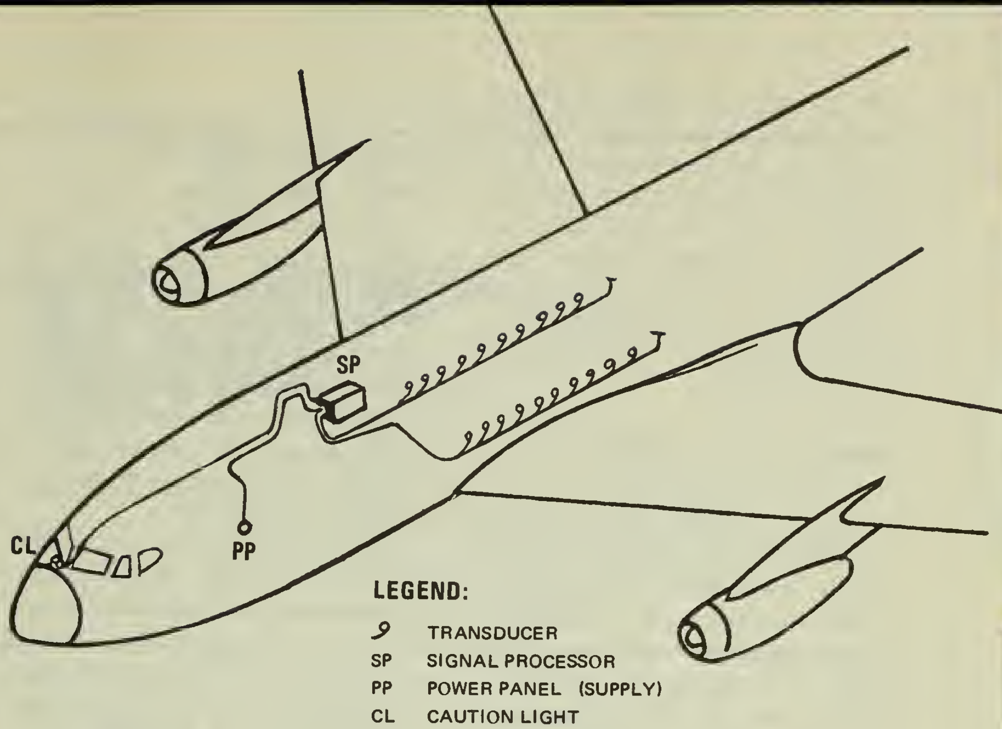
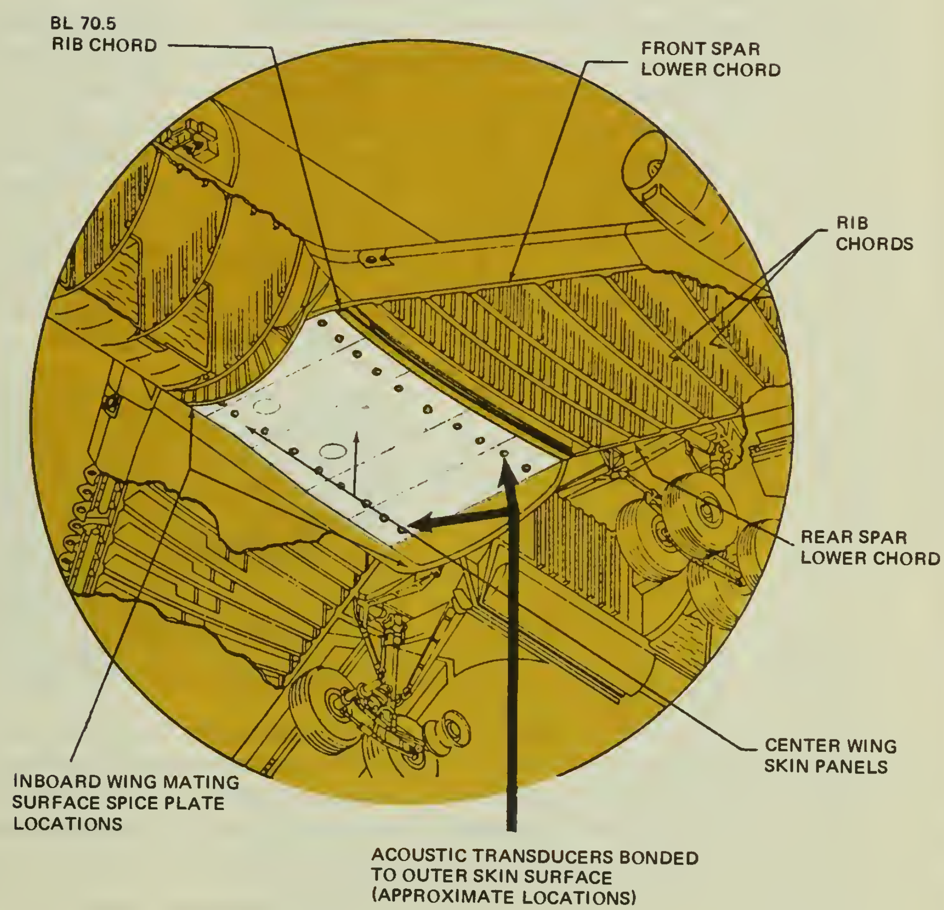


Figure 1

Figure 2



nance and will also require a fly-in program to a "Queen Bee" site. The fly-in schedule will be based on highest time aircraft first. (The ACDS will be removed during the installation of TCTO-989 as the fleet continues to be reskinned through 1988.)

HOW DOES IT WORK?

The system consists of 20 temperature-compensated acoustic transducers that are epoxy bonded to the lower center wing surface. These transducers are connected by coaxial shielded cable to a signal processor located on the right hand side of the aircraft (just opposite the main cargo door). The system is powered by the 28 volt DC TR Bus nr 2 and is operable anytime AC power is available to the nr 2 TR (i.e., AC power is applied to the airplane). The signal processor circuitry filters out all lower frequency signals generated by mechanical noise such as jet engine noise, air flow, landing gear thumps, vibrations, structure flexure (rubbing parts, loose fasteners, joint creaking) hydraulic system noises, hail or rain impingement, etc. The processor amplifies signals in the 200-250 KHz range which are generated by crack growth or "popping" in 7178 aluminum material. This signal will illuminate an amber caution light on the copilot's instrument panel and a red "test/crack" light on the signal processor. Additionally, one of several fuses (internal to the signal processor) is blown to provide a semi-permanent indication as to which skin panel displayed a crack indication. These fuses in no way affect the operation of the system and *must never be replaced* without detailed physical inspection of the affected skin panel by qualified *ground maintenance personnel!*

CREW REACTIONS TO CRACK INDICATION

Illumination of the amber "wing crack" caution light, should be treated as indicated in Section III of the appropriate aircraft flight manual and/or Operational Supplements thereto. The most important consideration is to recognize that illumination of the caution light is *no cause for panic*, but it does require positive actions!

The light is not likely to illuminate during straight and level, unaccelerated flight. A panel is unlikely to propagate an unstable crack unless a high stress level peak is encountered, such as a sharp gust of turbulence, an increase in lift due to rapid maneuvering and/or increase in airspeed (such as during takeoff), or excessive wing bending stress due to lightened wing fuel with heavy body cargo, fuel or payload.

Therefore, it is essential (upon confirming the caution light indication, through the test/reset function) to reduce aircraft center wing stress levels by avoiding/departing areas of turbulence, reducing maneuvering bank angles reducing body fuel weight (by dumping), retaining wing fuel to minimize bending stress, and landing as soon as practicable/possible as the case m require. There is no restriction r quired on the use of speed brak or flaps, since neither the buff nor the change in lift generated these are critical to center wing sk loads or stress levels.

Secondly, it is important to ma a log entry in the AFTO 781 in cating the time at which the lig illuminated ("Takeoff plus xx m utes") the total fuel, the body fu and any significant flight conditio (bank angle, turbulence, etc.) that engineering analysis can curately determine the stress le encountered should a crack be co firmed by inspection.

In summary, the acoustic cra detection system on the C/KC-1 is designed to be a highly relia electronic sensing system, immu to spurious mechanical noises a false indications. It will be imp mented to provide an early wa ing of intermediate cracks in center section lower wing skin and when they occur, so that t can be detected and repaired p to a significant reduction in w residual strength. This system add a significant degree of co dence to the structural integrity an aging fleet until the original l er wing skin material can be placed with current state-of-the skin alloy. ★

ABOUT THE AUTHOR

Lt Col Charles L. Miller, U. Illinois 1961, completed UPT Moody AFB Class 62-G. He f EC/RC-47s in Vietnam, the 135Q in support of the SR-71 was Chief of Safety for the BW at Beale AFB. During a NA exchange tour he flew the Bo 707 and was tanker single mana in charge of developing air ref ing procedures for the Canac Armed Forces. His current ass ment is major modification gram manager (structures) for C/KC-135 fleet at Oklahoma ALC.

NAME THAT PLANE

This was the first American bomber to be powered by jet propulsion alone. Two 4,000 pound thrust G.E. engines were encased in the fuselage. For answer, see Page 28.

THERE IS A WAY

Annually the Air Force recognizes a given number of individuals, units and commands for outstanding performance in safety. However, competition is keen and not all win major awards. To recognize all of those, AEROSPACE SAFETY is featuring one or more in each edition. In this way we can all share in recognizing their fine performance and, perhaps, learn some valuable lessons.

Nominated For The Chief of Staff Individual Safety Award

TSgt Larry C. Hoercher

33d Communications Group (AFCS)
March AFB, California

As a volunteer additional duty ground safety NCO, TSgt Hoercher was extremely successful in reorganizing and revitalizing the ground safety program at the 33d Communications Group. Recognizing the need for a better program, he volunteered to take on the job of ground safety NCO. He set up an office independent of the host wing with which he developed a fine rapport and cooperative working relationship. Coupling past experience with a strong initiative for self-ucation, TSgt Hoercher created the finest ground safety program in the history of that Communications Group. His programs of instruction were directly responsible for the improved safety record of that unit. TSgt Hoercher's most notable contribution was his success in bringing cardiopulmonary resuscitation (CPR) education to the entire March AFB community. He gained CPR instructor status during an off-duty education program and then proceeded to create a base-wide CPR training course. TSgt Hoercher's program has reached over 400 Air Force people and is w being extended to provide this valuable training to local civic organizations. TSgt Hoercher's aggressive, participatory approach to ground safety and his enthusiasm and initiative have resulted n an extremely successful ground safety program.

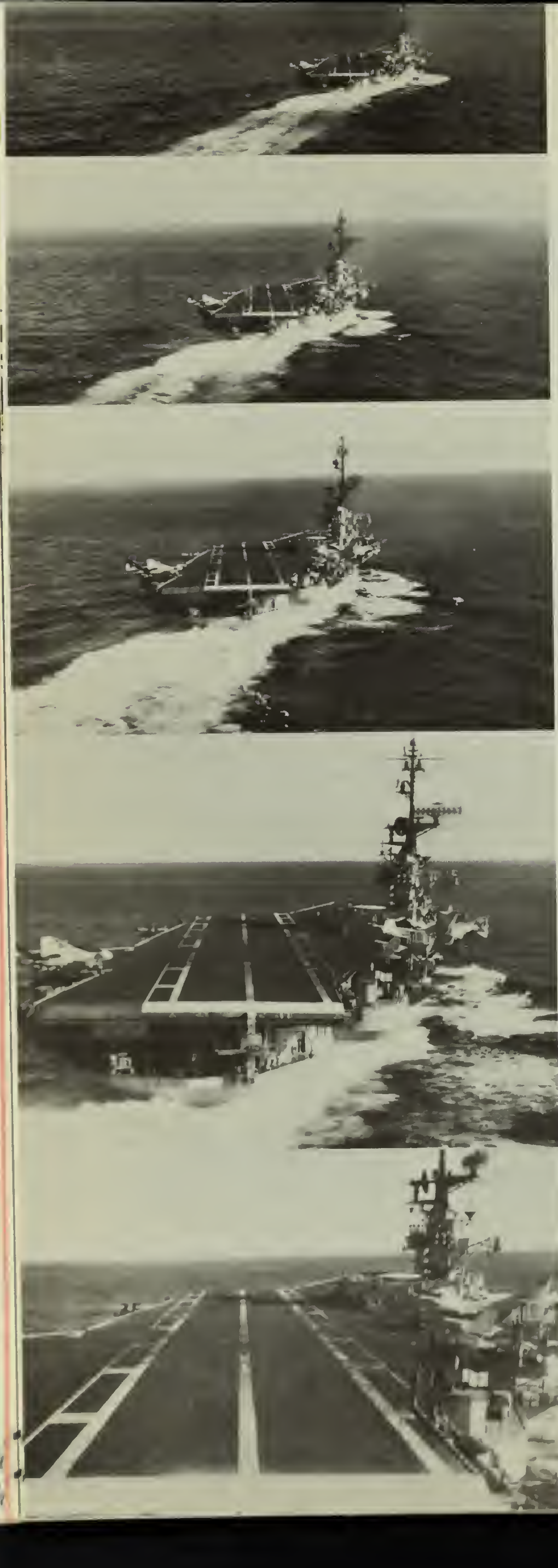
TSgt John D. Sutherland

51st Composite Wing (Tactical) (PACAF)

Carbon monoxide poisoning has been a recognized hazard in Korea. TSgt Sutherland conducted a year-long campaign to educate USAF personnel of its dangers. He wrote a series of articles that were featured in newspapers and on radio. He designed posters and placed warning signs in prominent places to obtain maximum exposure. The result: zero carbon monoxide poisoning fatalities in 1976.

In 1975 the wing had five industrial military disabling injuries. Through his knowledge of AFOSH and OSHA standards, TSgt Sutherland was able to better educate unit commanders and supervisors. That and his expert management of industrial safety education and inspection programs contributed significantly to reducing disabling injuries to one for the year.

TSgt Sutherland also did an outstanding job in motor vehicle accident prevention. He prepared a bilingual vehicle dispatch briefing which is presented by motor pool personnel to drivers leaving the base in Air Force motor vehicles. For all persons attending the local driver's orientation course, he developed a pamphlet describing driving hazards in Korea. His work in all areas of ground safety saved valuable USAF resources. ★



A CITY AFLOAT

Text and Photographs
CAPTAIN JAMES J. LAWRENCE
Directorate of Aerospace Safety

A Navy A-7E streaks past the scenic Pacific coast line heading westbound. The pilot tunes TACAN station, not found on the regular aero nautical charts, and receives a bearing of 280 degree at 60 miles. This Corsair II pilot has completed hi Navy Undergraduate Pilot Training and transitio training in the A-7. All that remains is his qualificatio for carrier landings. His destination: The USS Cora Sea. A pilot's first landing in a new aircraft is a trau matic experience. A pilot's first landing in a new ai craft on an aircraft carrier can be death-defying.

The pilot contacts the Carrier Air Traffic Contro Center (CATCC) which is similar in equipment an mission to our land-based approach controls. He told he must hold while the ship prepares for the nex launch and recovery cycle. The CATCC controlle sets up the A-7 pilot in a typical Navy carrier approac pattern: the 340° radial, 20 miles at 5,000 feet, t hold. Another aircraft is on the same radial, holdin at 21 miles and 6,000 feet.

Carrier operations are supervised by a senior offic in carrier control. This individual, appropriately name the Air Boss, oversees the total launch and recove operation. When the deck and personnel are ready fo the next cycle, the Air Boss contacts CATCC and ha them start the waiting aircraft down. The action begin

Aerospace Safety magazine sent me there to obser the action. A glimpse at the activities and peculiariti of our sister service, the Navy, is the goal of this a ticle. For most Air Force aircrews, their knowledge aircraft carrier operations is limited to those carri landings practiced by crew members on a wetted dow hooch bar in Southeast Asia. These imitations of ca rier landings usually preceded the dead bug drills an followed the poker game. Naval carrier operation however, are a great deal more involved. In this ar cle, I will tell the story of the Navy Aircraft Carri and the massive support it takes to keep this ci afloat operating.

et's leave the A-7 pilot up in the holding pattern a while and take a look at what goes into making planned approach and landing possible. The USS al Sea, is a "Midway Class" attack carrier officially gnated CV-43. The ship was originally commis-ed in October of 1947, just after the Second World . The carrier is older than most of the pilots it ommodates, but it has undergone numerous modifi-ons and modernizations since it was first launched. most extensive was back in the mid-1950's when original straight deck was replaced with an angled t deck and modern steam powered catapults were lled. The Coral Sea boasts a proud history to in-e five combat cruises during the Vietnam War and and medical support during the SS Mayaguez inci-. To date she has made 18 overseas cruises.

or those of you unfamiliar with the Navy, the size his monolith ship is mind boggling. Consider that 's company (those permanently assigned to the) normally numbers as high as 2,710. When an air is aboard for a combat cruise or deployment, the ber of bodies on board increases to 4,400-4,500 ole. Just think of the room needed to house, feed support a contingent this large at sea. The aircraft ier is nearly one thousand feet long, bigger than football fields; the flight deck extends over the and is 420 feet at the widest point. Her height the keel to the top of the mast is equal to a 20 building.

uring my 4-day stay aboard the USS Coral Sea, I the opportunity to observe all phases of carrier support activities. The ship is powered by four geared Westinghouse turbine engines which spin four engine shafts so large, I could not get my arms fully around them. Twelve giant 165 psi boilers provide the steam for these powerful turbines. The ship is fully capable of supplying all the electrical and fresh water needs of the 4,000 plus people on board. Two generators are constantly operating to produce all the electricity for normal shipboard requirements. Five-stage condensers turn sea water into usable fresh water for personal use as well as use in the boilers and turbine engines. Duty on these lower decks is definitely tough. Temperatures normally run about 100°F but can go as high as 140°F in hotter Pacific climates. The buddy system is extremely important, and several engine areas are constantly monitored by closed circuit television.

Above the engine decks are the support decks. Here you find many of the services which complete the definition of the aircraft carrier as a city afloat. Ship services include a print shop, post office and motion picture area. Also available are a butcher shop, cobbler shop, library, bakery, two barber shops, tailor, laundry, dry cleaner and carpenter. The ship's company has doctors, dentists, JAGs and chaplains. There is a 23-bed hospital, a TV and radio station, and a magazine and newspaper office. Take your typical Air Force base directory and jam all the services listed into a 1,000 foot by 400' hangar. That's your typical aircraft carrier.

It should be obvious by now that so many people and functions crammed into this shop necessitates quarters and work areas much smaller than those used by

A City Afloat continued

Air Force types. Upon arrival on the ship, I was escorted to my waiting stateroom, but stateroom is a bit of a misnomer. The room was 8' x 12' with two bunks, dressers, and a small closet area. My initial reaction was that if I encountered such quarters at an Air Force base, I would immediately declare them unfit and pull my crew to a downtown motel. I shortly realized, however, that I had been spoiled, for my quarters were of the best available, especially for single occupancy.

Ship's officer company and Air Wing people often share rooms a good deal smaller than mine, and enlisted personnel live in areas reminiscent of old war movies. Eight or more men are often jammed into an area no bigger than most AF johns. Being alone or getting away by yourself is an improbability. Such conditions, encountered during cruises which could last six months or more, make Air Force life seem rather pleasant by comparison.

During cruises, the work day is just that; a full day's work. Most people average 16 hours of duty daily. This

The landing signal officer studies the approach of an S-3. He communicates directly to the pilot. The wave-off signal initiator is in his left hand.

is just as well because there is not much to do beside work. Recreation facilities are limited to evening closed circuit television or semi-new movies in the different wardrooms. Exercise opportunities are confined to the large area, just below the flight deck. Here, one can jog, play basketball, throw a football or a frisby, but these activities are curtailed when the Air Wing is aboard with its 78 aircraft parked on this maintenance deck. All alcoholic beverages are banned aboard ship as is gambling. Of course, no women are on board a combat ship. Extra-curricular activities are evidently limited.

Despite conditions which appear sub-par by ou[r] normal working standards, I found the people to be highly motivated and for the most part proud of thei[r] ship and duty. This can only be attributed to the maintenance of a delicate line between discipline and motivation, though the typical Air Force person would fee[l] the discipline much more severe than he normally encounters. It is a tribute to the Commander, Captai[n] George Aitcheson and his officer and enlisted supervisors that this balance can be maintained for lon[g] periods at sea.

Let's return to that A-7 pilot we left holding on th[e] 340° radial. The purpose of the cruise during which [I] visited the USS Coral Sea was for carrier qualification[s] for pilots in the Navy's equivalent to an Air Forc[e] RTU. These Navy pilots are transitioning into ne[w] aircraft and need to certify their carrier readiness a[s] part of the transition curriculum. A certain number o[f] both day and night Traps (engagement on the cable) touch and go's and CATS (catapult takeoffs) ar[e] needed by each pilot.

The CATCC controller receives word from the Ai[r] Boss that operations are to begin. During day operations, this ATC controller would bring the plane dow[n] to a certain fix then turn him over to the Air Boss fo[r] a VFR approach. At night, the poor visual cues a[t] sea demand some type of precision approach. This i[s] supplied by the carrier controlled approach (CCA) controller who takes the hand-off from the approac[h] controller. The CCA man has equipment identical t[o] that of a land based GCA controller. The night flyin[g] aircraft is brought to a one-half mile final by CCA an[d] then released for the approach under VFR.

At this one-half mile point at night or abeam th[e] ship in daytime, the pilot contacts the landing signa[l] officer (LSO) who occupies a small deck on the po[rt] side (that's left) of the ship, just forward of the fa[n]

tail (the ship's rear end). There, he is in perfect position to observe the aircraft's rate of descent and line-up with the flight deck. If you remember back to those old World War II movies again, you should be able to picture that guy on the deck frantically waving those hand held red paddles. Those men were the original LSOs. Today, direct radio communication with the pilot makes paddles obsolete.

From experience, the LSO knows how to gauge line up, angle-of-descent, and rate of descent. Additionally, three lights in the aircraft's wheel well area are connected to the pilot's angle-of-attack (AOA) system and show the LSO if the aircraft is on speed, slow or fast. The LSO must rapidly compute these visual inputs and talk the aircraft down if any deviations are present. Should the LSO feel the approach is unsafe, he will initiate a Wave Off (go-around) over the radio and by a visual signal on the optical landing system (meatball). The LSO has complete control of the aircraft at this time and safety of flight is dependent on his competency.

The A-7 pilot's view of the deck is fascinating. He has to fly his approach to a landing strip one-tenth the size of those normally used by non-carrier pilots. One of the keys to doing this successfully is his ability to focus his attention on the meatball and not on the deck. Rate of descent seems high and the movement of the ship up and down can cause visual inaccuracies, if you rely on deck aimpoint alone. The result has often been short or long touchdowns, both of which can be deadly.

The optical landing system is more accurate than our AF VASI system. Glide path deviations are shown immediately by movement of the meatball up or down in relation to a set of horizontal green lights. Get too low and the ball turns red. The Navy carrier pilot works with the meatball and his cockpit AOA all the way to touchdown. As he approaches the carrier, the pilot also uses a red light display on the fantail of the ship to line up properly. This series of red lights running from the deck to the water indicates if the pilot is on course , left of course or right of course

Should the pilot periodically glance at the approaching deck, he would see deck lighting in the form of white landing zone outline lights, and strobes running down the center. Four arresting gear cables stretch across the deck sitting approximately 8 inches off the ground on flexible metal bridges. A fifth can be in-

The catapult is attached to the nose gear and pulls the aircraft at super high speed (Note: Tie-down chains still in place).

An A-7 is catapulted into the wild blue. Airspeed will be as high as 160 knots when he reaches the end of his short run. Note the catapult steam beginning to rise just ahead of nose wheel as he begins his launch.

After each catapult takeoff, the tremendous amount of steam necessary to power the high speed tow escapes to the deck. The whole area goes IFR for several seconds as the crew readies that catapult for another launch.

A City Afloat continued

stalled which has a net barrier, similar to our MA departure end barriers to trap an aircraft with an operative or broken tail hook. The barrier cable several hundred feet long and each end is connec below deck to a huge mechanism with spools at e end and hydraulic pistons in between. These dev are set at a certain resistance pressure based on gross weight and type of aircraft to be trapped.

If the Navy pilot follows the meatball exactly touchdown, he should get a successful engagement the third barrier from the end of the ship. A lo things can happen, however, such as a hook skip over the cable, a cable breaking, or just plain mis the wires. In order to prevent an awfully uncomfort departure over the end of the deck, the Navy p selects full military power just as he touches down that he will be airborne almost immediately if the gagement doesn't work. The sensation caused by celerating from 150 knots or higher to 0 knots in 3 400 feet is quite an experience.

When the aircraft stops and the pilot regains sciousness (just kidding), the cable operator start retract the cable under direction of a deck wo called the cable hooker. He carries a large crow like tool which is used to unsnag the cable from aircraft's tail hook. When clear, the pilot's attentio moved to a taxi director. All taxi directors wear ye clothing from the waist up so they are easily di guishable. The director has the pilot raise the aircr wings and taxi clear of the flight deck foul line. I aircraft is going right back out, it lines up for its on one of the two operating catapults on the for section of the ship. If the aircraft is finished for the or needs maintenance, it is taxied to one of the el tors for movement down to the maintenance dec

Aircraft going back out follow the green shirted pult operator's directions. The catapult itself is a genious device that consists of a steam generated p which runs down a cylinder and track with the air in high speed tow. In just a few hundred feet, ar craft is accelerated to 150 or 160 knots—safe f airspeed. The tow is via the nose gear or a special ness. The steam is built up to the level approp for the type and gross weight of the aircraft nex Aircraft with afterburners are also held back w special retainer bar which has a breakaway pull stre specifically designed for each type aircraft. It con to the deck of the ship and the rear of the air

out this bar, the aircraft would not be able to re- static with the afterburners in operation.

e aircraft taxis into position via direction by the shirts. The catapult is connected at the nose gear rness point and the hold back bar is installed. The ıst deflector shields are raised and the CAT offi- ives the pilot a run up signal. The pilot advances hrottles to military and checks his instruments. If thing is OK, he selects afterburner, checks for lights, then salutes to the CAT officer. This in- es the pilot is ready. The CAT officer visually s the area, and if clear he touches his hand to the The CAT operator again checks the deck then he he launch button. The acceleration effect is fan- but it leaves you with a feeling of total helpless- for a few seconds. Any problem with the CAT esult in your unsolicited entry into the water with ig ship steaming right toward your young body.

an Air Force safety officer, carrier operations probably be the cause of his blood pressure ng to never before attained heights. To the nov- bserver, the confusion aboard the flight deck leave an impression of utter disorganization. But continue watching the total action from a high e point, you begin to realize that in actuality, highly coordinated exercise. Each man has his ılar function, which he performs before passing craft on to the next link in the chain. Accidents, er, do happen and the Navy recognizes the in- safety difficulties in carrier operations. Aircraft ew members are dependent on the successful ion of large, intricate machinery. Air Force rules, e marshalling distance criteria in AFR 60-11, n-existent on the close confines of the flight Traps and Cats occur within feet of many deck s. Despite these dangers and opportunities for s, comparatively few occur.

s company includes a safety staff, headed by mander (AF Lt Col equivalent). These safety ers roam the ship observing all aspects of carrier on. Safety hazards and unsafe practices are ad- on the spot and a daily safety bulletin is ited to all work areas which cites observed un- pects for all to think about. The safety officer USS Coral Sea also publishes a safety brochure very two months. This publication offers flight k safety articles, recognition for individuals who have significantly contributed to ship safety, and feed- back channels for evaluation of the onboard safety program.

Copies of *Approach, Lifeline, Mech* and *Driver* are abundant for aircrews to read. The Navy accident re- porting system is almost identical to our AF hazard report and is disseminated to all other similar users, for lessons learned value. A shipboard safety report- ing system has been developed which allows an indi- vidual to communicate an observed safety deficiency directly to the ship safety staff. The safety officer works directly for the ship's captain in a staff agency capacity and can bypass all normal channels on any ship's func- tion which demonstrates unsafe practices.

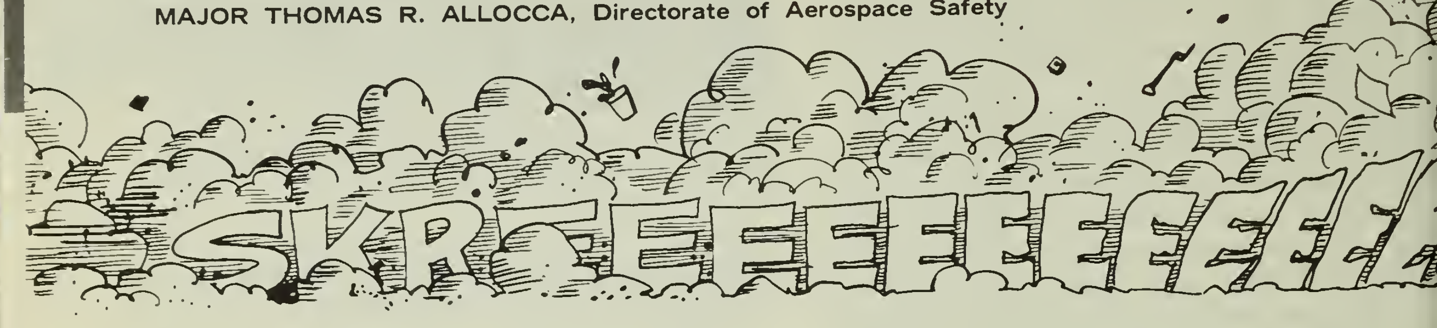
In the field of aviation safety, the Navy has some unique problems that are quite different from its Air Force counterparts. When an aircraft accident occurs at sea, the aircraft is normally lost. Salvage operations can only be accomplished in very extreme circumstances. For this reason, the bulk of investigating evidence is normally not present. To help in this deficiency the Navy has developed what they call their pilot landing air television (PLAT) system which has a two-fold pur- pose. The system consists of several closed circuit tele- vision cameras which record all flight deck operations from several angles. Pilots use these films just as pro- fessional athletes use game films to visually examine and evaluate their errors, post-flight, and to correct these mistakes in the future. The PLAT system also serves as a safety feedback. Often events on board oc- cur too fast for the naked eye to record, such as some type of CAT malfunction. The PLAT has been used time and time again by safety boards to determine the cause of a particular accident.

My experience during this four-day visit to the USS Coral Seat is onlv partly chronicled here. Space pro- hibits telling the full story of all the support functions it takes to keep this ship operating efficiently. The days are long, the conditions austere, and the pay low, as it is for all of us. Yet these men serve proudly and cling to many naval traditions despite the inconveniences. The USS Coral Sea is a warship and her men dispatch their business seriously. I wish to thank the COMNAV- AIRPAC Public Affairs Office at North Island NAS and the captain and crew of the USS Coral Sea for their hospitality and assistance during my visit to that ship. I'm particularly grateful to Lieutenant Comman- der Paschall, of the Strike Ops office aboard the Coral Sea for serving as a guide, a source of information, a baby sitter and a friend during the course of my visit. ★

The Aborted Take

IT HAS PAID TO BE READY

MAJOR THOMAS R. ALLOCCA, Directorate of Aerospace Safety



It is a grim axiom among flight safety circles that the pilot is the first to arrive at the scene of an accident. Since this is often sadly true, it behooves this hardy group of souls to do all they can to ensure that they don't join any of their ill-fated brethren. This is especially true for a particularly critical maneuver—the aborted takeoff.

At this point I'd like to introduce examples of numerous fatal mishaps which occurred during aborted takeoffs. I really wouldn't "like to," but it would support my contention that this is a very difficult maneuver to pull off without incident. But you know what? There simply are **not** that many recent examples of tragic mishaps which occurred during rejected takeoffs. Does this make the maneuver any less hazardous? Hardly . . . because it incorporates many facets of danger known to aviation: compressed time, maximum performance, environmental problems (the change from ground-to-air) and the necessity to instantaneously switch from a "go" to a "stop" mentality. Perhaps the most hazardous of these facets is the compressed time problem and the mental switch.

Probably the most difficult "decision in seconds" which ever faces a pilot is an emergency during the critical phase of takeoff. The phrase "decision in seconds" deserves a few words.

It has been said of pilots that they are good differentiators, but not good integrators. I assume this means that too high an escalation of demands on the judgment of the flyer may cause him to make a wrong decision. Well, of course, this is true! Too high an escalation of demands on anyone's attention may lead to an erroneous decision! The logic of this statement will not be labored beyond ". . . I need time to think about this/I'll call you back in the morning. . . ." It follows then that we make an unusually grotesque demand when we insist that a decision—involving equipment valued at millions of dollars and often involving the lives of many people—be made correctly in a matter of a few seconds. Yet, this is precisely what is required of a pilot facing the aborted takeoff decision.

It is unnecessary to detail the mathematics of the performance calculations governing takeoff for various aircraft. Suffice it to say that a multiengined aircraft must

be able to take off after an er
has failed, provided it has rea
a certain speed the moment
failure occurs. The Flight Ma
figures have been authorita
and precisely determined—a
of undisputed accuracy. But,
consider, for a moment, the
ner in which these figures
derived.

Flight Manual data is obt
by the manufacturer's and U
test pilots, working under
mum conditions (from an
runway and forewarned wit
knowledge that they are goi
have to stop the aircraft fr
speed just below decision sp

Since human time lag ten
improve with practice, test
who have accomplished this
erate-stop maneuver several
usually acquire a reduced re
time. The "average" Air For
lot, on the other hand, may
accomplished this procedu
the simulator once in the p
months, and may never hav
ried out the exercise at high
in the aircraft itself. This co
is further intensified by th
that rejected takeoffs are ex
ly expensive (in brake an
wear and, therefore, are no
tinely practiced) and—mo

ntly—that the line pilot is
xpecting to abort the takeoff.

e test team conducts their
erate-stop drill in the most
nt manner possible: feet
rly positioned, eager to ap-
e brakes with little thought
ke wear. The line pilot pro-
by retarding the throttles
selecting spoilers or other
ing devices, and then apply-
e brakes. Little wonder the
d takeoff is more hazardous
"operational" flying than
"test" work.

difficulty of this dilemma
ther compounded by the
e failure: power or no pow-
stion."

aircraft certification tests
ade simulating an engine
. Test calculations are thus
on this assumption: in the
l between a "failing" en-
nd brake application, the
t continues to accelerate at
ine-out rate. The line pilot,
ting to an engine failure in-
n on takeoff roll, has no
wonder whether the indi-
is real or spurious—he will
t to stop. But in the event
rroneous indication, he may
mpting this stop with full
power—a decided differ-
er the flight test scenario.

All these elements add up to one unpleasant fact: that the line pilot is faced with a difficult task indeed when he encounters the aborted takeoff problem. There are, however, a number of approaches which can be taken to minimize the very real hazard of a rejected takeoff.

Like so many other safety aspects of modern aviation, the best solutions are expensive—prohibitively so. These "best" fixes could include lengthening a large number of runways all over the world or reducing takeoff weights by considerable amounts. Such ideal solutions, as we all realize, are difficult to fully implement. As a consequence, we're left with alternative cures which often fall into the "improved training" category.

Training **is** an effective solution but it is a "soft" fix, which means that, owing to human variability, it cannot be counted on to be completely effective. In the case of the rejected takeoff, however, the evidence suggests that training has been effective in simplifying the "accelerate-stop" problem.

The training has made our guys ready. The "go-no-go" problem is similar, in many respects, to Hamlet's "TO BE OR NOT TO BE" conundrum. But unlike Hamlet's procrastination, our crews have made their decision. The development of "decision speeds" has simplified this difficult mental transition. And whether we've called such speeds "V_{go}" or "V_1" or "Acceleration check" we've been effective in instilling the fact that although you've got a "go" mentality when takeoff roll begins, it may shortly become a "stop" mentality if a problem occurs. Furthermore, the record shows that we've performed this trick fairly well.

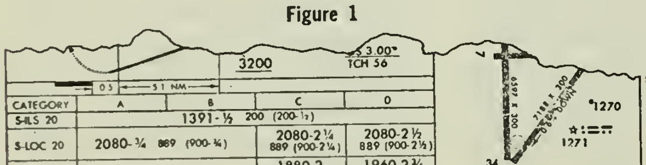
It is appropriate to conclude this discussion with the reminder that mistakes are a normal feature of human behavior and that aviation is a human activity. Another feature of human behavior is the belief that "it won't happen to me." Well "it" might. And if that "it" happens to be a rejected takeoff, I think you'll agree that the argument advanced in this article strongly suggests that you'll be years ahead if you're ready. (Note: The author wishes to acknowledge that portions of this article were extracted from "Human Factors in Air Transportation" by R. A. MacFarland.) ★

USAF IFC APPROACH

Q. Can I circle from a PAR or ILS?

A. Although the precision radar scope can be used to provide azimuth information for a surveillance approach, FAA Handbook 7110.65, Air Traffic Control, does not provide instructions for issuing clearance for a circling approach from a PAR. When flying an ILS to circle, it is advantageous to descend to MDA using localizer only since this will allow maximum time to sight the runway and perform the circling maneuver. In some situations flying the glide slope to the circling MDA may provide lower minimums (Walla Walla City County ILS RWY 20) or may be required for the descent to circling MDA (Yakima Air Terminal ILS RWY 27), (see figures 1 and 2). When flying such approaches, ensure that you are within the circling area for your category aircraft before beginning the circling maneuver. The appropriate circling area for your category aircraft can be found in either AFM 55-9, table 4, or AFM 51-37, figure 7-13. In all cases AFM 51-37, paragraph 6-22c(4) states, "Do not descend below circling MDA until the aircraft is in a position to execute a normal landing."

Figure 1



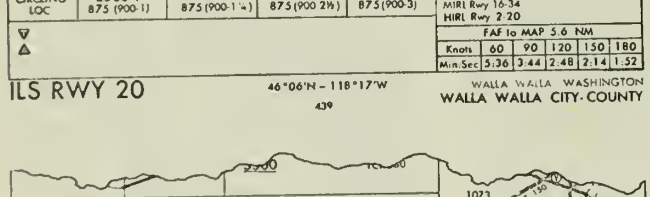


Figure 2

Q. AFM 51-37 mentions Timed Approaches in Chapter 6, under Low Altitude Approaches. What are Timed Approaches?

A. Timed Approaches refer to situations in which the procedure turn or holding in-lieu-of pattern pri to the Final Approach Fix (FAF) will not be flow Timed Approach clearances include a specified tin at which to depart the FAF inbound and may be co ducted in a non-radar environment or with rad vectors to the final approach course. The Air Traff Control Handbook states, "Timed Approaches m be used at airports served by a tower if the followi conditions are met:

a. Direct communication is maintained with t aircraft until the pilot is instructed to contact t tower.

b. If more than one missed approach procedu is available, none require course reversal.

c. If only one missed approach procedure is av able, the following conditions are met:

(1) Course reversal is not required.

(2) Reported ceiling and visibility are eq to or greater than the highest prescribed circli minimums for the instrument approach procedure use." The controller should issue a time check to aircraft before specifying a time to leave the F inbound. A two minute or five mile radar interval l tween aircraft is generally used but this may be creased as necessary.

Q. Recently, while in the High Altitude Enro Structure. I received a clearance from ARTCC to p ceed direct to a VORTAC while outside of the Serv Volume Area. Although I was able to properly tu and identify the station, was I correct in accept the clearance?

A. The Air Traffic Control Handbook states, "Wh specifying a route other than an established air or route, the Service Volume limitations of the p ticular NAVAID should not be exceeded." There an exception to this. The limitation may be excee when routing is initiated by ATC and radar moni ing is provided. So, if you can adequately tune identify the station, have the appropriate clearan and are radar monitored, you may fly the faci while outside the Service Volume Area. The ra controller should give an approximate heading to facility to aid in position orientation. If orienta with facility is subsequently lost, you should inf the controller and request another vector. Remem this only applies enroute. Your planned route flight should remain within the Service Volume of NAVAIDs used.

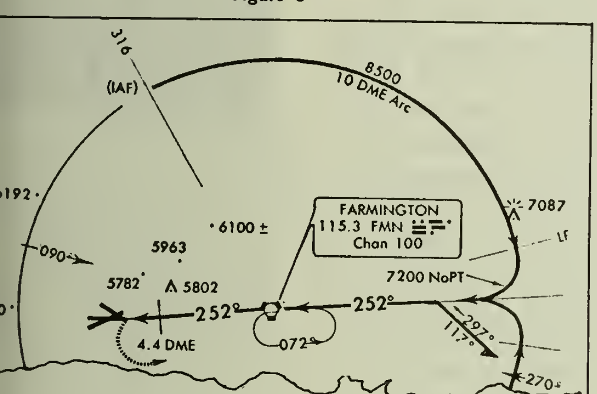
By the USAF Instrument Flight Center
Randolph AFB, Texas 78148

What weather is available from the Air Route ffic Control center (ARTCC) Metro?

You can expect much the same weather infor- :ion as from Military Metro. Several years back TCC initiated a test program at certain centers provide updated weather information for pilots. rently, Kansas City Center is the only center with ro capability. They also have direct service weath- adar readout. So, if you are transiting Kansas ARTCC, give Metro a call on 369.9 UHF for cur- weather.

If I am filed to Farmington and inbound on the Radial and subsequently cleared for the ap- ach, can I proceed to the 316 Radial and 10 DME (IAF) Arc East and shoot the NOPT or do I have o to Farmington and do the procedure turn? (See re 3)

Figure 3

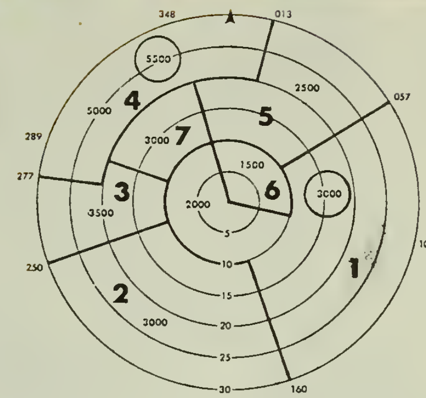


In the absence of an amendment to your flight route, you should proceed to Farmington and ute the approach from the VORTAC, this would lude flying the NOPT. However, if you prefer g for the NOPT, simply request clearance from

I have often been vectored below the minimum altitude. What allows the controller to issue lower altitudes?

The controller follows a Minimum Vectoring Alti- Chart that has been prepared for all airports (see 4). The altitudes provide one thousand feet acle clearance (2,000 feet in designated moun- us terrain). When in designated mountainous in, but mountains are not a factor, the terrain ance can be reduced to 1,000 feet. An example

Figure 4



would be approaching El Paso International Airport from the East. Because all the mountains are to the West, the controller can safely vector you with 1,000 feet of clearance even though you are in mountainous terrain. Another factor that adds flexibility to the vectoring altitude is that the controller can vector you at a lower altitude, and provide lateral displacement from an obstacle rather than altitude clearance. For example, see Sector 4 in figure 4. There is an obstacle that would raise the vectoring altitude. Rather than restrict the entire area the controller can vector you no closer than 3 miles to the object (5 miles if the object were beyond 40 miles from the radar antenna), and keep you at 5,000 feet with no compromise of safety.

Q. The last sentence under the CAUTION in AFM 51-37, paragraph 6-16b(2), has created debate and confusion in our unit. Referring to ILS Final, it states, "If the glide slope is recaptured to within the above tolerance (one dot below or two dots above the glide slope) descent may be continued to DH." Does this mean that if I am more than one dot (half scale) below glide slope, after I have descended below localizer minimums, but still above the ILS Decision Height, that I can continue the approach providing I recapture the glide slope?

A. Definitely not. A missed approach must be accomplished unless you are visual. The intent of the last sentence in the CAUTION is to allow the pilot to continue the approach if he is **above** localizer minimums, not if he is below localizer minimums. If you are more than one dot (half scale) below the glide slope and below localizer minimums, you may not be within the safe obstruction clearance limits of the approach and you must execute a missed approach. Change 1 to AFM 51-37 will eliminate the confusion in this CAUTION. ★

MAIL & MISC

NAME THAT PLANE

Reference your "Name That Plane" contest in the November 1977 edition of **Aerospace Safety** magazine, your writer is the person that cannot correctly identify the aircraft on page 12. The fighter shown is a Republic P-47 but it never was a "Juggernaut" as stated in the answer. The P-47 shown in a late model (bubble canopy) of the "Thunderbolt." The P-47 was one of the "Thunder" series built by Republic. Being a colonel in the Confederate Air Force, I am proud to inform your editors that there are still flyable P-47s in existence. To the best of my knowledge, the CAF and the Puerto Rican Air National Guard (PRANG) are the only owners in the world of operable P-47s. The P-47 was referred to as a "Jug" on occasion but that was in reference to the large "jugs" or cylinders found in the massive powerplant.

It is also hard to imagine John Wayne as flight lead of the "Jugs" because a short corporate memory search in my office failed to recall a movie in which the "Duke" flew the P-47. He flew P-40s, Hellcats, and Corsairs, but no P-47s. (The CAF still flies the above mentioned WWII fighters.)

Aside from being picky, picky, picky, I enjoy the Safety Magazine. Keep up the good work.

H. C. STEVENSON
Major, USAF
Colonel, CAF
505 Yorkville Rd
Grafton, VA 23692

Obviously, you know more about the "Jug" than our writer. However, as I recall and recently had confirmed by a longtime Republic/Fairchild employee, the "Jug" got its name from its shape, not because of the size of the "jugs." Anyway, it was a great airplane. As for John Wayne, too bad he missed out on flying the P-47. Thanks for writing and keeping us honest. —Ed.

NAME THAT PLANE ANSWER

The XB-43, which first flew in May of 1946. Its top speed was 507 mph, and it had a 2,500 mile range with an 8,000 lb bomb load.

ALERT AIRMAN

Because a young airman was alert and took immediate action, damage to a landing C-5A may have been prevented.

A1C Roy Zacharias was on duty as weather observer at the Travis AFB Remote Observation Site on the afternoon of 29 June 1977. At approximately 1900Z he noticed that a C-5A on approach to runway 21L appeared to have only one set of wheels on its nose gear. Just minutes later, the aircraft made another approach (on 21R), which brought it almost directly over the observation site. Airman Zacharias, now convinced that his original startling observation had been correct, immediately informed the Tower and the Base Weather Station of the situation.

The crew and controllers would have been unaware of the condition of the aircraft had it not been for Airman Zacharias. Undetected, this condition could have led to a landing that might have proven disastrous to both crew and aircraft. As it was, the crew and operational support personnel were notified, technical experts were consulted, and a safe landing was executed. No damage to the aircraft or injury to the crew resulted. ★

☆U.S. GOVERNMENT PRINTING OFFICE 1978 789/855/54

ajor Delbert F. Miller   1Lt Paul G. Bryant

391st Tactical Fighter Squadron (TAC)
Mountain Home Air Force Base, Idaho

jor Miller and Lieutenant Bryant were flying the o aircraft in a three-ship student training sortie uled to include air refueling and low level navi- i. All aircraft systems worked normally until com- n of air refueling. As Major Miller's F-111 air- left the contact position he noticed a drastic tion in thrust available. At this time, the crew d the right engine rpm decaying toward idle. All ots to recover the engine, including the automatic t system, failed to terminate rpm decay. Follow- dditional dash one procedures, the throttle was l in the cutoff position in preparation for an air- attempt. During the airstart checklist sequence, Miller discovered he was unable to move the e out of the cutoff position. The aircraft left the ng area and proceeded toward home station ac- nied by a chase plane. Major Miller selected urner on the good engine in order to maintain e and airspeed while attempting unsuccessfully the frozen throttle. As the descent for a single straight-in approach was initiated, the left en- as retarded from afterburner to military power. liately following this throttle movement, the left rpm began to decay past the military range. Miller took appropriate dash one action, but the continued to decelerate toward idle. As the rpm d through approximately 50 percent, engine generator electrical power was lost, thereby preventing normal radio or interphone communication and compounding an already critical emergency situation. At this time, with both engines inoperative, Major Miller was forced to place the left throttle in cutoff to attempt a restart. Rapidly failing hydraulic pressure made loss of the flight control system imminent. Additionally, the loss of pneumatic throttle boost forced Major Miller to release the control stick in order to use both hands to move the left throttle from cutoff to idle. Using visual gestures, Major Miller instructed Lieutenant Bryant to hold the control stick forward while he completed the airstart procedure. Lieutenant Bryant recognized the need to maintain as much windmilling engine rpm as possible so that hydraulic pressure for the flight controls would be available. Lieutenant Bryant's action provided sufficient engine rpm to allow controlled flight. Major Miller managed to bring the left throttle to the idle position and effect an airstart. The engine was then set at a stabilized power setting sufficient to complete a single-engine landing at Mt. Home AFB. Investigation of the incident revealed a broken throttle cable on the nr two engine. The cause of the nr one engine flameout is still under investigation. Present findings indicate a malfunction within the main fuel control unit. Major Miller's and Lieutenant Bryant's superior airmanship and prompt response to a critical in-flight emergency possibly saved a valuable fighter aircraft. WELL DONE! ★

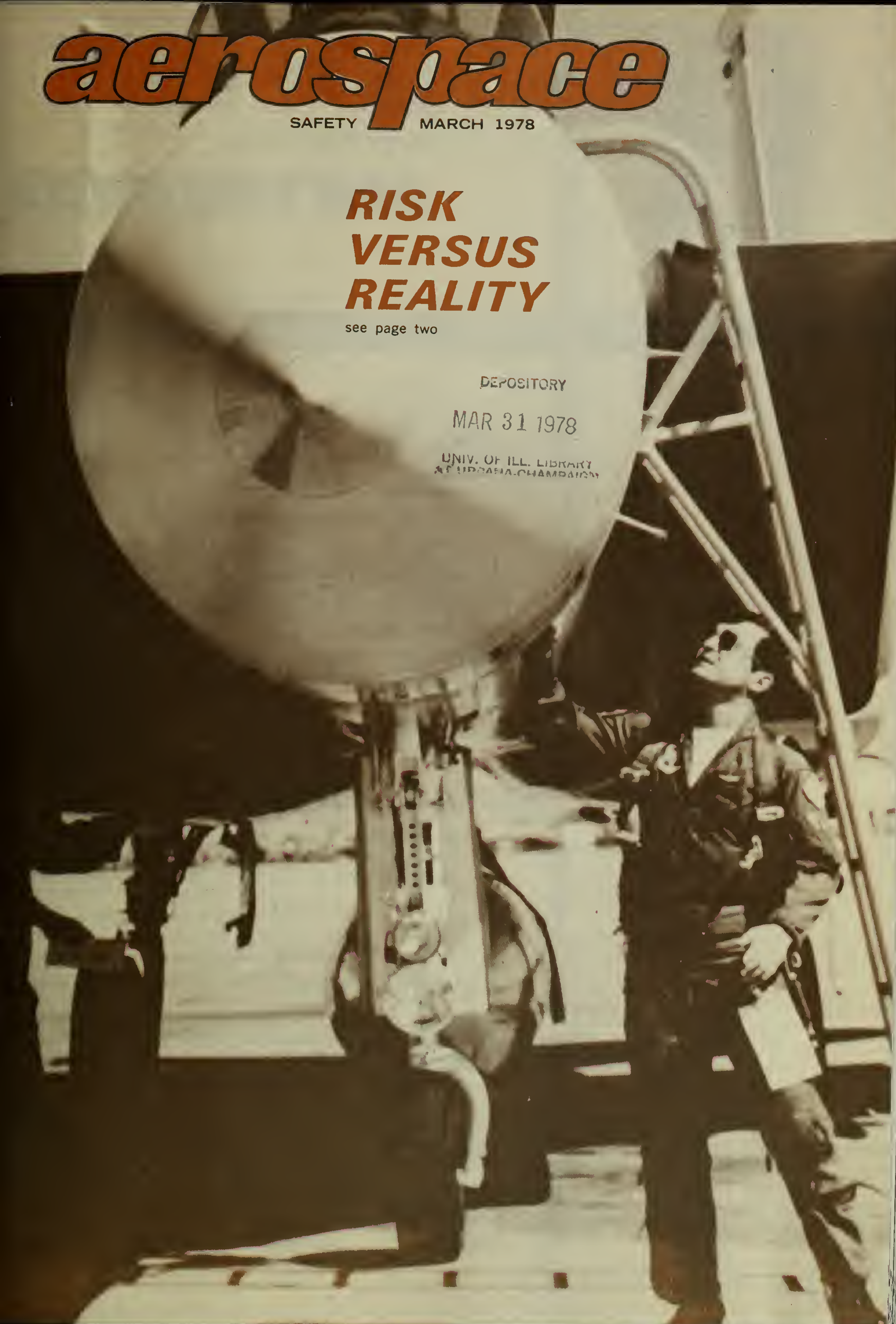

CONTROL
FO

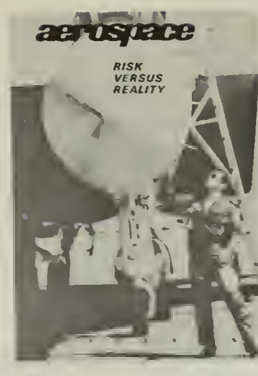
aerospace

SAFETY MARCH 1978

RISK VERSUS REALITY

see page two





MARCH 1978

UNITED STATES AIR FORCE

aerospace SAFETY

THE MISSION - - - - - - SAFELY!

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

MARCH 1978 AFRP 127-2 VOLUME 35 NUMBER 3

34

NEWS FOR CREWS

rmation and tips to help your career from the folks at Air Force Military Personnel Center, Randolph AFB, TX.

CAPTAIN CARL L. McPHERSON • Air Force Military Personnel Center

SUPPLEMENT DYNAMICS

Rated Supplement is a part of the total Air requirement for pilots and navigators. It pro- he necessary augmentation for increased crew ted staff positions during contingency oper-

utilization of rated officers in non-rated duties a new concept by any means. In fact, in the 50s over 18,000 rated officers were serving in as then called "behind-the-lines" duties.

y's Supplement is made up of approximate- 0 rated officers in the grade of lieutenant lieutenant colonel who are currently serving port career fields at all levels throughout the ce. It also includes rated officers assigned to nd Professional Military Education (PME) ns.

ldition to meeting Air Force needs for wartime tees, the Supplement provides an excellent nity for career broadening of rated officers in rational areas. This has been extremely im- in providing the management experience and ound needed by senior Air Force leaders. It is t that dictates that Supplement duty be pre- for those officers who clearly demonstrate ential to assume such positions.

ecember 1977, a board of senior Air Force of- stablished guidelines for the distribution of fficers to all support career fields. The board ned that the preponderance of the future nent inventory should be assigned to the re- and development, logistics, and instructor areas, but that no non-rated career field e excluded from the future assignment of nent officers. The guidelines established are enough to be easily adjusted depending rying rated officer inventory sizes.

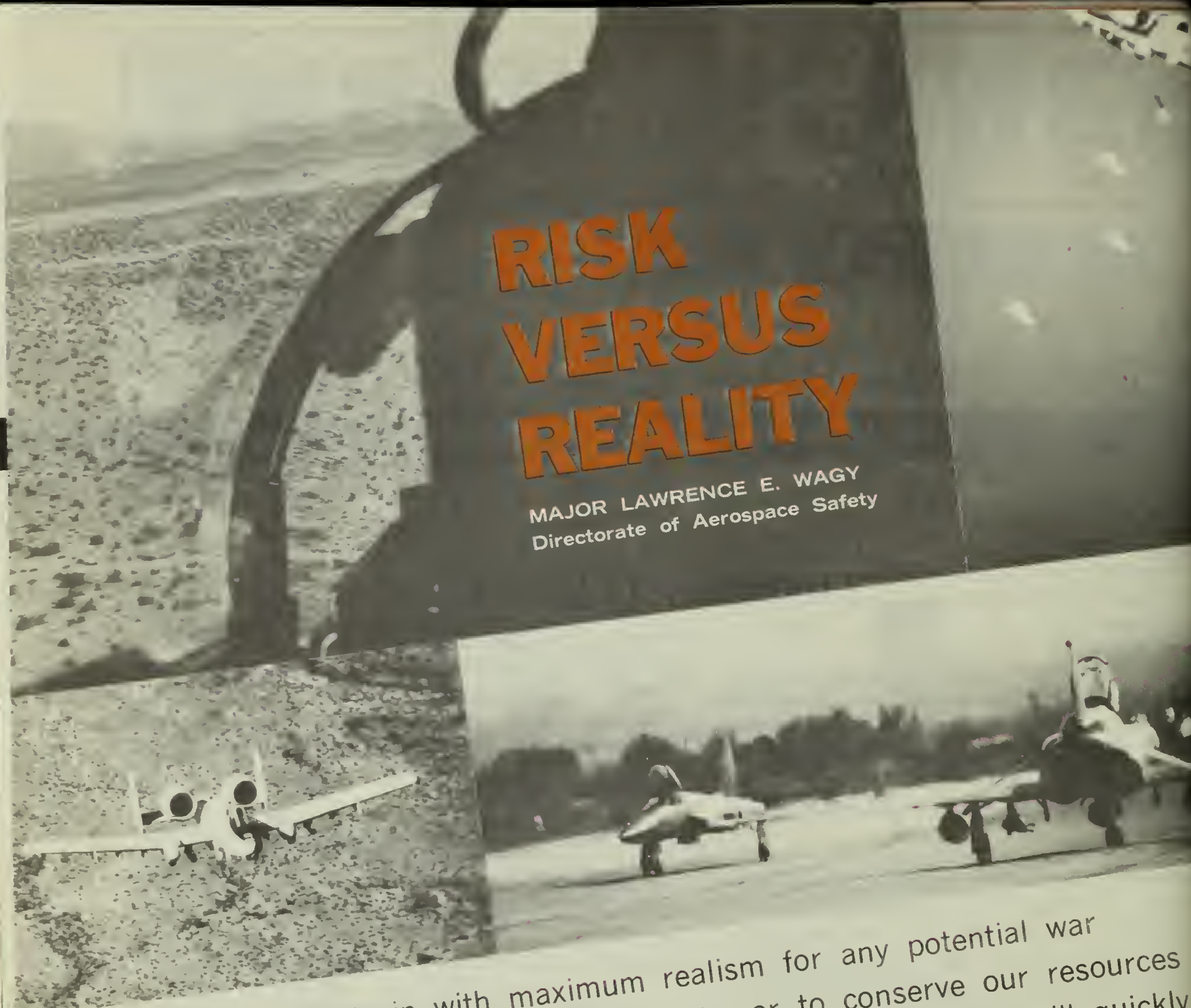
al avenues are presently available for entry Supplement, including: (1) completion of an ogram resulting in a directed duty assignment nto a non-rated specialty related to the area uate study, (2) identification and nomination of an officer by a local commander or major command for a specific non-rated position, or (3) request by an officer through the CBPO for a duty AFSC change to a non-rated specialty. Additionally, all rated officers "on-the move" (returning from overseas or completing controlled tours) are reviewed monthly by a rated officer review board and are considered for entry into the Supplement. This board meets nine months prior to the officers' "availability," and also reviews those officers currently in the Supplement for possible extension. In an effort to provide the same selection opportunity to all rated officers, the review board has recently been expanded to include all rated officers who meet minimum time-on-station and first "gate" (72 months of operational flying credit) criteria.

Each of these entry routes requires the approval of AFMPC to ensure that control is maintained over the number of rated officers assigned to each non-rated career field. AFMPC is also responsible for ensuring that inputs possess the quality necessary to produce career broadened senior managers.

In order to maintain the viability of the Supplement—ensure that those officers can, in fact, respond to contingency requirements—as well as provide career broadening opportunities to as many rated officers as possible, a continuing "flow" of officers into and out of the Supplement must be maintained. For this reason, Supplement tour lengths are strictly controlled. The Supplement completion date of an officer assigned overseas or on a stabilized stateside tour normally coincides with the date the officer rotates from his overseas assignment or the date he completes his stabilized tour. The tour of all other Supplement officers is normally three years. While extended Supplement duty was not uncommon in the past, future Supplement tour extensions will be on an exception basis and only after a careful individual review.

The Supplement inventory is projected to decline until flying training production rates reach the level needed to maintain an inventory to meet overall rated requirements. Rated officers currently serving

continued on page 28



RISK VERSUS REALITY

MAJOR LAWRENCE E. WAGY
Directorate of Aerospace Safety

Is it better to train with maximum realism for any potential war situation and accept the inherent costs, or to conserve our resources at a lower level of proficiency with the idea that war itself will quickly provide the necessary training to combat readiness?

question that will always raise a heated argument among a group of aviators Should we train the way we —so that we can fight the we train?" Lieutenant General P. Flynn, AF/IG, surfaced question again in a letter pub-d in the *TIG Brief*. General n observes: "We were not born ability, it's a learned thing, courage. It follows that in ing exercises, reckless abandon worst thing to practice and ervatism is a reasonable se . . ."

t's review the basic schools ought. The first I'll call the p A approach. This approach ves that no peacetime loss of on system or aircrew is justi- This approach is particularly lar in post war years when se budgets are being cut to the A's argue that no single etime mission is worth the loss expensive weapons system.

ith understandable logic. A's ve that our peacetime training first of all conserve our re-es for future combat. Training d be limited to very low risk on profiles. Aircrew profi-y would involve only the s of flight. Pilots would be capable in the area of inter-ate to high altitude navigation, ght-in instrument approaches landings, and controlled range patterns. When accidents do r, training operations are re-ed further.

e Group A theory is that while erving our resources (both man machine) in peacetime, we develop, by need, the more essive skills in actual combat. concede that we will be less on capable in the early days onflict and suffer heavier s, but believe the resource s can then be afforded. Aircraft and aircrews are, of course, easier to obtain during periods of hostility. It is difficult to argue with the concept that training under fire is very effective for those who survive.

At the opposite end of the spectrum is the Group B school that believes that we should show no restraint during peacetime training. Realism is their key to success. Their motto is "a few good men" with the obvious, though not conceded, corollary of "a few good weapon systems." The very believable axiom is that the nature of modern warfare demands that a force be honed to combat sharpness on "day 1" of conflict in order to gain and maintain the offensive and defensive advantage.

Obviously, I have overstated the case for each extreme. When I was younger I believed that all very senior people were of the Group A persuasion and that all the young people were Group B types. This idea was further substantiated by the fact that as I grew older my views became more conservative as well. This coincided with my early years as a safety officer. A safety officer's grade card used to be a reflection of his unit's accident experience. A safety goal of a zero accident rate was reflected in the safety attitude of zero accident potential.

In truth, I've found our senior officers aren't of the Group A philosophy at all. In a 1976 *TIG Brief* letter, USAF Chief of Staff General David C. Jones said, "Readiness must be the prime concern in all our actions . . . new and better ways to meet the readiness challenge are needed . . . ORI's need to be realistic and simulate wartime tasking as closely as possible." My exposure to several senior officers while working with the Air Force Readiness Initiatives Group (AFRIG) convinced me that our leaders are far from my previous impression of being of the Group A school.

Now I will give my opinion, which, as you may suspect, falls somewhere in the middle. As a mathematician I find this subject somewhat easier to see by charting the variables. Since I don't have the exact figures to place on the axis, I will ask that you only consider these charts as depicting a representative relationship between the variables. Refer to Chart 1.

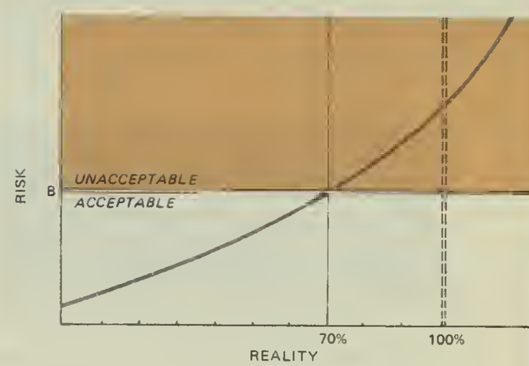
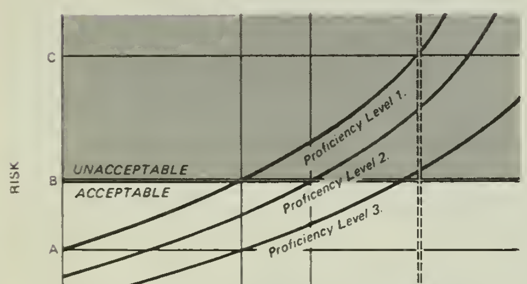


FIGURE 1.

If we were to look at a single element of our combat-ready forces (e.g., TACTICAL FIGHTER FORCE) at their present proficiency profile, the relationship between reality and risk look something like this. The percent reality would depend on how close we are to "training the way we fight." Reality of 0 percent would mean our training would depict no element of the way we would fight. Reality of 100 percent would be exactly the way we would fight. I also assume that departing from reality is always to a more conservative mission. The chart would obviously be invalid if 0 percent reality was accomplished practicing spins at low altitude.

Risk is a value that reflects the probability of loss of aircraft and/or crew. Intuitively, I believe, the line gets steeper as we approach 100 percent reality both from a human factors and a material



RISK VERSUS REALITY
continued

standpoint. The more we demand from our people and aircraft the higher the failure rate will be.

Acceptable risk is the element we charge our commanders to establish. This should be relatively constant, based on maintaining resources to meet our combat mission commitments. (The concept of acceptable risk is very real as exemplified by the fact that we program and fund for replacement aircraft when a new weapon system is acquired.) By plotting this acceptable risk (b), we can then program our reality (on this hypothetical chart: 70 percent) to produce that risk.

The chart can be made three dimensional by modulating the proficiency profile. See Chart 2.

Experience has shown that risk is decreased inversely proportionate to proficiency. Therefore, the function of risk and reality should flatten as the proficiency profile of the aviators is increased. For a constant acceptable risk (b) training can be structured to appropriate levels of reality depending upon proficiency. The potential to increase reality past 100 percent could exist, although I see no need.

Let's look at a proficiency level 2, combat-ready element that is flying at the percent reality (70 percent) that produces an acceptable risk (b). This type of training should increase their proficiency profile. If it does not, acceptable risk is probably too low. This increased proficiency allows the unit to increase reality without increasing risk until the unit is as combat proficient as external factors will allow. (Excessive pilot turnover, for instance, could drive proficiency down.)

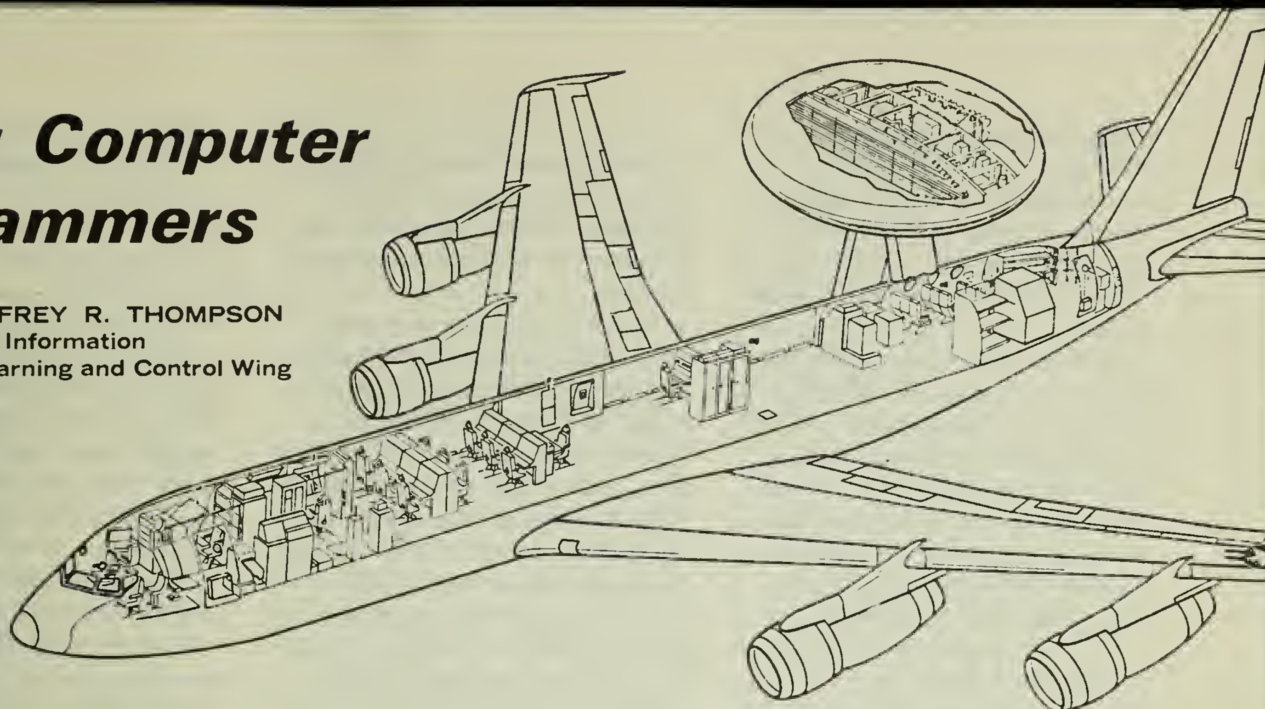
On the other hand, a proficiency level 3 unit that is flying at a reality (50 percent) to the left of their maximum reality is exercising the Group A approach. They are accepting a risk (a) wh is approximately half of their maximum. The problem with t approach is that it tends to compound in the wrong way. This will probably see a decrease in proficiency and an increase in When this results in a couple of operational accidents, the Group A approach will probably be reflected in further reality restric tions which will again reduce proficiency. Over a period of tim this unit will drive itself farther and farther from reality and combat readiness.

The third consideration is th Group B approach. The annals full of unsuccessful attempts to *force* an element to the right on reality scale. An example is a pr ficiency level 1 unit attempting train at 100 percent reality. No that their risk (c) is twice that which is acceptable. A better ap proach would be to start at their maximum acceptable reality (50 percent) and as their proficiency increases, increased reality can follow.

Essentially I interpret Genera Jones' and General Flynn's messages to reflect this analysis. Ge eral Jones is saying that in order to meet our readiness challenge must ensure we train as near rea as our acceptable risk will permi General Flynn points out that to train with "reckless abandon" i curs an unacceptable risk.

Acceptable risk is a concept that used to float poorly around safety community when zero los rate was a goal. I believe this is no longer true. The goal of th safety community at all levels should be to assist the comman in attaining a readiness capabil through training at the maximu level of reality that incurs an acceptable risk. ★

ying Computer
ogrammers



AIN GEOFFREY R. THOMPSON
Office of Information
Airborne Warning and Control Wing
AFB OK

ɔgrammers everywhere, drop
our coding forms! Climb
board the E-3A, the Air
s newest, most sophisticated
t, and fly away with the
n crew of AWACS!

ACS is an acronym for Air-
Warning and Control System,
criptive title for the E-3A.
-3A is a modified Boeing
-frame with a radar antenna
ed in a 30′ rotating radome.
man crew is trained to help
friendly airspace anywhere
world.

n all that computer hardware
around (the E-3A carries
on-board computers, the
being an IBM 4PI-CC1
computer) it's only natural
ogrammers fly too. And that's
what happens at the 552d
ne Warning and Control
at Tinker AFB, Oklahoma.
whole new vista—flying—
d to the wing's traditionally
l-bound programmers in July
And ever since that first
they've helped troubleshoot
ses of airborne computer
ions, and after landing,
up software problems using
nd knowledge.

the ground, each programmer
pecialist in weapons, surveillance, battle staff, etc. But during an operational flight, he must advise the crew on many kinds of computer support problems. He must know both JOVIAL and assembler computer languages, and must be able to work with the airborne operational computer program (AOCP), data base generation and edit programs, and several stand alone utility programs.

AWACS programmers are excited about flying—it adds to their already challenging Air Force careers by bringing them closer to the operational crew they support.

"Before my first flight I thought in terms of a split between the ops guys and the support team," said Second Lieutenant Robert Hinsey, a Test and Evaluation team member for the wing. "Now all that's changed. The key word's not split, but interface."

Flying also broadens a young officer's experience early in his career. As Hinsey explained, "On my second flight I was the mission crew commander and directed a complete software test of the latest software version supplied by Boeing Aerospace Co. I had a private communications net to the aircraft commander, and each of my seven test team members sat at a console and conducted his own functional area testing, e.g., weapons or surveillance."

Staff Sergeant Robert Smith, a wing switch action programmer, added his own personal glimpse. "My first flight was everything I'd anticipated, and more. Unlike commercial aircraft, the E-3A has no windows, so to see out, you had to look forward, through the cockpit, not sideways past the wings. And all those things I'd heard about in-flight lunches weren't true. They were most edible!"

Staff Sergeant Jim Wishart, a weapons software expert, pointed out he was a little nervous before his first flight because the comm equipment was different from that he had used in the mission simulator (ground support facility). And aircrews strictly enforce proper comm procedures!

"The nervousness quickly disappeared when the test started, however," said Wishart. "In fact, I was so preoccupied I didn't realize the aircraft was performing hard turn maneuvers until the surveillance operator mentioned it over the intercom. When I did look up I felt the tug of gravity and watched the changing reflections of the sun glide across the ceiling as they flickered through a port mooring."

Flying helps both programmers

Flying Computer Programmers
continued

and mission crew. Programmers find the airborne system functions much as they expect, a tribute to Tinker's excellent software training facility.

"On the other hand, seeing the system in its operational environment held plenty of surprises," said Captain Joel Champion, a wing computer systems analyst. "Since the software is designed to support the crew, observing the software/man interface firsthand gave us ideas for further enhancements."

The best advantage of having in-flight programmers, is their ability to implement on-the-spot work-arounds. Even without extensive debug tools, software experts can often diagnose an internal problem by observing its external effects, then suggest a temporary problem avoidance procedure.

"Whatever computer problems we experience," said Champion, "must be put in perspective. Significant in-flight software glitches are rare due to thorough software testing before operational release. The system is also designed to automatically recover from most hardware problems, using system redundancy."

It might be interesting to relate two recent examples of in-flight assistance, where on-board programmers helped make successful missions out of possibly unsuccessful ones.

To explain the first case, you must first understand the Airborne Operational Computer Program (AOCP) will not work until it receives all real-time avionics inputs, such as navigation and position data, plus confirmation that all required hardware is turned on. So on one occasion the AOCP was missing at least one avionics input, and did not "come on." The condition was suspected by the crew as being a software malfunction, whereas the computer systems analyst diagnosed it correctly as a computer loop condition. The computer was branching (hanging up) around a set of start-up instructions, in effect saying, "I need that missing input!" over and over again. As soon as the missing avionics input was provided, the program functioned normally.

In the second case, as a result of a power fluctuation, the AOCP underwent a series of automatic restarts. The original diagnosis was a hardware malfunction, but the computer analyst discovered otherwise. The power fluctuation had caused bits of information on the memory drum not to be correctly updated, thus preventing a successful restart. The confusion wa[s] caused by the error analysis software, which provides maintenance advisories, calling the problem a computer arithmetic unit (CAU)* failure. So the in-flight analyst simply reloaded the memory drum with a fresh copy of AOCP from tape, and the mission continued smoothly.

These cases show how in-flight programmers serve as "answer me[n]" when software problems arise. It also means they've learned to talk to crew members using correct terms, to get to the point faster. But programmers still have a lon[g] way to go to be completely conve[r]sant with the mission crew. The system is terribly complex, and each analyst is an expert only in one or two functional areas. So they'll continue to rely heavily on the crew's operational expertise. And, since not every flight

*The CAU is the E-3A 4PI processor sub-unit which performs all arithmetic and logical operations specified by the AOCP software.

Listening to the 4PI computer maintenance technician, MSgt John "Ad" Whattam (left), explain a suspected software deviation, is Capt Joel Champion, airborne software analyst. Direct conversations between maintenance technicians and software programmers, du[ring] flight, speed up troubleshooting since probl[ems] are observed live. Sgt Whattam is seated at the computer display maintenance operator position, where he receives maintenance advisories from the computer.

Working with an E-3A airborne surveillanc[e] technician, SSgt George C. Lewis (left), Capt Rick Roger, airborne computer pr[o]grammer. Capt Roger was called to a su[r]veillance console to observe a degraded scop[e] display, since he can often diagnose a possib[le] software problem by observing its extern[al] effects. Earlier in the mission, Capt Roge[r] sat at a weapons director console and teste[d] earlier software change[s].

es a programmer, on more than
occasion programmers have
summoned to the wing com-
l post, placed in radio contact
the aircraft, and helped re-
problems.

November 1977 a very dif-
t use of in-flight programmers
rred. Eight programmers
ed aboard a "P" sortie (train-
rtie for the flight crew) and
over the back end (mission
positions) of the aircraft.

'e had three goals in this
light," said Major Jack
th, Chief of the wing's Soft-
Management Division. "We
ued to train our people in
rne software test procedures;
ok a final version of a com-
program supplied by Boeing
pace Co. and checked it out
operational environment; and
rified a special software
ge built for 'EUROTEST
n E-3A follow on test and
ation deployment to central
e.*

e test flight went exactly as
ed. The software package was
d at the macro (system) level,
rogrammers learned from the
of the flight environment.
programmer sat at the console
own area of software responsibility, e.g., weapons or surveillance. He performed switch actions; talked with the on-board computer maintenance technician; and worked with the on-board radar maintenance technician just as a mission crew member would.

Lieutenant Colonel James Gregg, Chief of the wing's Systems Programming Division, explained how important the test flight was. "Our vocabulary is saturated with terminology. We must speak the radar-weapons-aircrew language in addition to our language as programmers, so we are at the apex of the information explosion!"

In a nutshell, flying the E-3A is essential since all software can't be exercised in the mission simulator. After all, if a software problem can't be isolated, it can't be solved. That's why there are 12 flying programmer positions in the 552d AWAC Wing's Mission Support Deputate—two in software management, eight in operational programming, and two in systems programming. All flying programmers complete physiological, life support and water survival training, just as do other aircrew members, and they must pass flight physicals. Six Boeing contractor service people are also flight qualified.

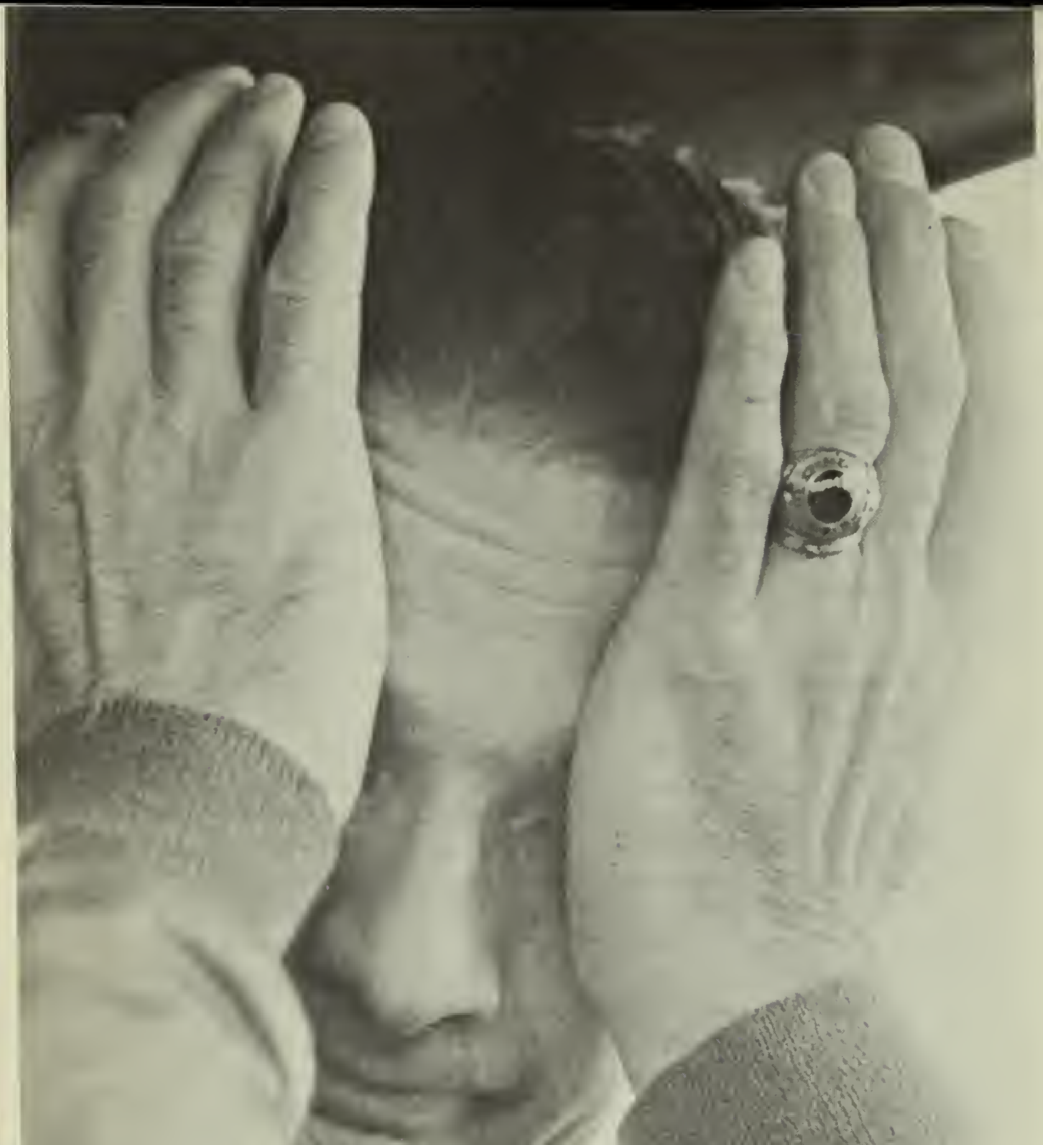
Flying programmers like their work, and they meet the people who must live by the accuracy of their programming. Said Captain Champion, "Suppose a weapons director is trying to get a fighter to commit on a target. If the wrong call sign has been loaded, it's an abort because of invalid data base. So the relationship can become personal. No one wants to be responsible for decreasing a fighter pilot's chances of downing the enemy!"

To conclude, flying programmers ensure the E-3A crew can make full use of software's greatest advantage—system flexibility, i.e., every computer action doesn't have to be hard wired. Software is cheaper and more powerful than "all hardware" configurations, but only if it works! So with a system as complex as AWACS, programmers will continue to debug and isolate problems; however, at the 552d they'll also do it in the air! ★

---

*Seven wing programmers actually accompanied the E-3A to Ramstein, Germany, to provide software support. Being on mobility status, to deploy on short notice anywhere in the world, is another difference between programmers at Tinker and those stationed elsewhere.

Readying a mobility kit for deployment to Europe are (l to r) TSgt Bruce Kaufman, verifying labels and tape content; Capt Dave Wiederhold, making individual tape requests; and Capt Norm White, checking tape requirements against tapes packed. Software experts deploy to support the E3A, just as do maintenance personnel. And they take them duplicate copies of critical tapes, e.g., the Airborne Operational Computer Program.



Picture this one. A 707
freighter, passing Las Ve
at the end of an all-night J
LAX nonstop, continues westb
at FL390, ignoring the repeate
descent clearances issued by L
center. After considerable effo
and anxiety, radio contact is es
lished through Arinc when the
craft is nearly 100 miles west o
LAX. Fortunately, the SELCA
(Arinc selective callup) chimes
loud enough to awaken at leas
of the three sleeping crewmem
and there is enough fuel for a s
return to LAX. In another ins
a DC-6 crew spent half an hou
circling Atlanta when they all
asleep with the autopilot on an
the turn knob out of the detent
Cockpit slumber parties are on
the more dramatic effects of s
fatigue. Some will say that suc
conduct is inexcusable. I wor
that oversimplification serves
mask some very real physiolog
problems. Several things can c
tribute to those awful sinking
spells, but some of these facto
be controlled.

Lack of sleep is the most ob
cause of pilot fatigue but sleep
a complex subject that scientis
only beginning to understand.
Basically there are two signific
different types of sleep of inte
to the aviator. Deep sleep pred
nates during the first half of a
normal night's slumber and is
characterized by very low elec
(EEG) activity in the brain. R
eye movement (REM) sleep b
after that initial three or four

SINKING SPELLS

a totally different kind of During REM sleep, EEG y is similar to that found in king state, plus there are eye movements and evidence aming.

siderable research has estab- a clear need for both types o. During several days of ar working conditions, you able to satisfy deep sleep ments and even maintain fficiency while awake by g for short periods. At the that time, your REM ac- vill be overdrawn and that will need to be restored least one very long sleep. ever, you miss an entire rest, you may be able to re- ood vitality with a normal sleep plus one hour for the eficiency and an afternoon balance the deep sleep ac- I have found that 10 to 15 of calisthenics after a short sleep is an excellent tem- substitute for lack of rest.

her factor to consider is cemia or low blood sugar, an cause malaise, fatigue, tation, and even lapse of usness. It is controllable ne very simple dietary ut it helps to understand hanisms involved.

you awake in the morning, od glucose level will be n the overnight fast. If you h coffee and sweet rolls, or er highly refined carbohy- ou may induce reactive cemia.

It works like this. Your system converts refined sugars and starches into glucose so rapidly that your blood sugar level rises at an abnormal rate. When the hemeostatic system that balances glucose levels senses the sharp rate and rise, it signals the pancreas to release insulin proportionately. In this case, the rate is abrupt and can only be sustained over the very brief time it takes for your body to convert the refined carbohydrates to glucose. The end result is that too much insulin is triggered to the bloodstream so that your glucose volume is soon driven well below the original, fasting level.

Proteins from a more normal breakfast are processed by the body at a much more steady rate so that appropriate quantities of insulin are metered out to stabilize glucose levels at the optimum point. Protein reduction and conversion continues for several hours and eliminates the peaks and rebounds induced by pure carbohydrate intake. Four dietary practices will prevent reactive hypoglycemia:

- Avoid refined carbohydrates (sugar and all refined starches).
- Eat protein-rich meals every four hours, especially when on flight duty.
- Use fruit or protein snacks for pick-me-ups at odd duty times.
- Substitute low-fat milk or fruit juice for coffee and soft drinks.

And speaking of coffee, I used to fly with a guy who drank gallons of coffee and never could stay awake. Turned out that he suffered from caffeine toxicity, a not uncommon problem that can cause poor sleeping, nervousness, headaches, and lethargy.

Coffee, tea, and cola, in moderate amounts, promote quick energy and clear thinking through the stimulant effect of caffeine. Above a certain level, caffeine ceases to be beneficial and becomes a hindrance to normal functioning. One cup of coffee or tea contains about 100 mg of caffeine. Twelve ounces of cola contain about 50 mg. Some doctors feel that 500 mg per day is enough, 750 mg is questionable, and 1,000 mg addictive.

Check your caffeine intake and be sure to include all the possible sources. Coffee, tea, and cola are obvious contributors, but caffeine is also present in chocolate and in many of the nonprescription headache and cold medicines, and over-the-counter stimulants.

Now about those cigarettes. One smoke raises the carbon monoxide in the blood to a level that equates to a state of hypoxia at 7,000 feet. Two cigarettes smoked consecutively raise the level to 10,000 feet, and these levels are further aggravated by actual cabin altitude. Smoking is unquestionably a contributor to fatigue.

When you do get drowsy in flight, try a few exercises, eat some nuts, and try to recall the thrilling contents of this column. If that doesn't keep you awake, nothing will.—*Adapted from Crossfeed.* ★

Now, at last, all is exposed! For the first time ever we present the untold story you've been waiting to read. Here it is . . . the unvarnished truth printed as it was written!

Confessions

The life of a military runwa
is not all glory, as you mi
suspect. But life could be
worse. I could be a radar anten
definitely an AC/DC existenc
even a taxiway light, being jus
one in a crowd. No, things cou
be a lot worse, yet there are so
disadvantages to being a runw

I remember when I first sta
out. That was a long way back
fact, my surface then was mos
packed dirt. The aircraft at tha
time were slow and lightweigh
No matter what happened, the
couldn't hurt me or my surfac
very much. Accidents during
landing were numerous, but t
pilots often walked away from
crash, just as people in autom
accidents often escape injury
today. My surface would be
plowed over, packed down,
was ready once again for busi
as usual.

I can still clearly recall my
reincarnation which occurred
prior to World War II. I return
that time as a concrete surfac
They painted me with lines an
subjected me to the pounding
tail-dragging fighters and lum
ing transports. These so-calle
state-of-the-art weapon system

Military Runway

As told to CAPTAIN JAMES J. LAWRENCE
Directorate of Aerospace Safety

ne peculiar habit of occasion-
round looping or depositing
is failed components on my
g surface. In those days,
g out of the aircraft was a
lt chore for the pilot. For
eason, so many of them
l it home and deposited
debris from one end of me
other. Patching me up was
nore complicated than it
my past life, but we suf-
through it okay. During this
ete period of mine, things
changed fast. The aircraft
l getting bigger, heavier and
The jet-age arrived and
nt with it a new breed of
ms and hazards to comple-
he age-old ones.

l, here I am today—reborn,
again, and fortified, your
eth century runway, com-
vith approach lights,
s, a high friction surface,
overruns. I'm longer and
han I've ever been before.
ers have spent innumerable
planning my every detail.
llars, mega-bucks, have
pent in my design, con-
on, modification, and re-
cation. Yet, despite so many
al advancements since my
inception, way back when, 17 percent of all the accidents which occurred in 1976, occurred on my surface. That's why I am speaking out today, after all these years. It's time I defended myself against all the ongoing accusations. You see, it's not so much me as it is you who have created my reputation as the primary object in the most hazardous phase of flight. You pilots and your aircraft have created this devilish image for me.

Let's examine the pilots first. I provide you with easy to identify approach lights, sequential strobes, landing markers, VASIs to tell you how your glidepath is doing, even distance remaining markers. But what do you do with all these aids? You physically attack at my approach lights. You land on my overrun. You disregard my VASIs, and cross my threshold high and hot, wasting thousands of feet of my landing surface. Your tires deposit rubber all over my approach end. Then, you come back the next day, landing in the opposite direction, and refuse to brake sufficiently in the first three-fourths of my surface. Instead, you try to brake heavily on the rubber you left behind yesterday, then blame me for your failure to stop in time.

Sometimes you forget your airspeed or angle of attack indicator while on short final. Who has to pay the price in the form of hard landing? I and my landing surface do. I've even had pilots miss me completely, landing at an airfield close by, thinking it was me. Some dummies have gone so far as to land on the taxiway that runs parallel to my surface. And what do these pilots do? They blame me even though my markings are proper, my nav aids are flawless, and these hazards are listed in their own IFR Enroute Supplement.

That's not all. Pilots consistently blow their tires all over me. Some forget to engage the antiskid brake systems. Others don't have antiskid brakes, but these pilots come equipped with big, heavy hams connected to their ankles. They stomp the brakes, even when crossing paint stripes, rubber deposits, or the cables that have been laid across me. When the tire can't stand the heat and it explodes, the pilots shamefully deplane and curse me,

CONFESSIONS OF A MILITARY RUNWAY continued

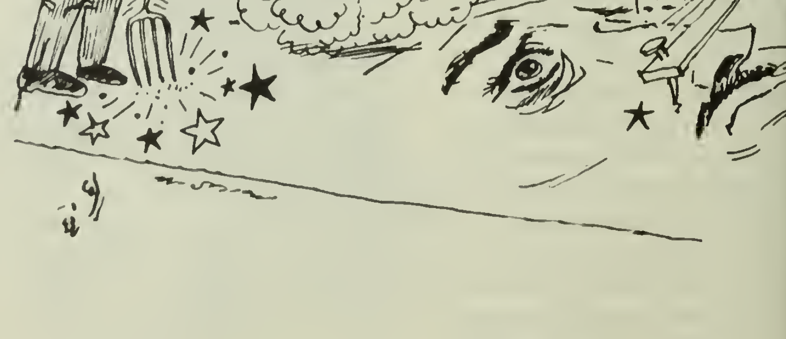
abusing my surface with kicks and derogatory comments.

Yes, Mr. Pilot, it had to come out. My evil reputation, fostered at stag bars and hangar flying sessions, is there because you created it yourself. Something like a modern version of the Frankenstein monster, you play the doctor that started it all, and I play the blameless monster. Of course, people only remember the monster, not the guy who really deserves the infamy. It's not bad enough that pilots have so much trouble on my runway surface, but they have to turn around and make airplanes that decide to malfunction during this critical portion of your flight.

Modern aircraft are fast and heavy. They come whizzing in over my overrun and touch down. Then, they proceed to do terrible things like collapse gears or cock the nose wheel to full travel in one direction. The aircraft gets wracked up, the crew or passengers may be hurt, and my surface is marred and torn apart. Sometimes a plane will land on me without gear, because that aircraft simply refuses to let its gear come down; that's assuming the pilot remembered to put the gear handle down in the first place. Sometimes they forget, despite perfectly good checklists. The list of possible malfunctions is endless. Flight controls may fail, throttles may stick, a flock of birds may attack the aircraft and smash a windscreen or FOD an engine (I can't stand the filthy creatures either, for obvious reasons).

And where do these scary malfunctions normally terminate? Where else but on my surface. I know they are often unavoidable, but some are pilot self-induced.

These smashups hurt. I app
you pilots. Use your emerge
procedures checklist, please
also **don't forget** the normal
checklists either. Overlooki
regular checks can result in
haps as great or greater tha
emergency facing you. Repo
emergency as quickly as po
so that fire and rescue peop
be waiting for you. Fires bur
up too, you know. If the pro
is with your gear and your f
sufficient, plan it so that I a
foamed down just before yo
and so that your fuel state i



you can safely land with.
f course, don't be afraid or
ed to call in and ask for
om a supervisor, a stan/
o, or a safety type from
quadron. I've seen a lot of
nts and, believe me, when
enalin is pumping, it's
forget or overlook other-
vious things. A calm head
ground, with the tech order
nay just find the solution to
oblem, and thus you may
ne another wreck.

ast topic for discussion is
ject of some natural haz-
at all too often result in
planes and pilots. Rain is
example. When dry, I'm
easygoing entity—docile
asant. But when it rains, I
lmit, some inner evil takes
become enraged. I just hate
nd what else can I take it
ut an aircraft? And take it
My favorite target is an
with little tread on its
hich flies final faster than
puted approach speed.
o is let the water pool
ound the zone it is landing
standing water keeps the
rom making contact with
ay surface. I believe you
result dynamic hydro-
The aircraft wheels either
in up or if they do, I slow
wn to a near standstill.
lt is a zero coefficient of
between the tire and my
Normal braking is use-
directional control can
tricky.

et runway situation is
nded when a healthy
d is blowing across me.
sharp pilots have discov-
t normally when landing
swind, the best bet is to
wn on the upwind side.
en I'm wet and a cross-
lowing, rain drainoff is
on this upwind side. In

fact, that may well be the wettest portion of my surface. The aircraft touches down in that slop, hydroplanes, and the crosswind takes care of it in a hurry. The aircraft is quickly deposited in the boondocks. Of course, hydroplaning can work equally as well with ice or snow on my surface. These substances often aggravate me even more than rain, and I can become especially treacherous.

My greatest annoyance, however, is those smart aleck pilots that think they know it all. You know the type. They check and double-check landing data versus runway length. They call base operations for the latest RCRs and query Ops on when and how these latest readings were taken. They fly their approaches on speed or slower, if their tech order recommends it. They pick an aim point and land on it, but stay away from puddles by clearing visually and checking with Ops or tower for areas of standing water. They use all speed reduction devices available and are careful with their braking technique. You never find this type with bald tires. They ruin all my kicks.

Well, there you have my confessions as a military runway. Landing may represent one of the more hazardous phases of the flight profile, but let's face facts. You guys have created the reputation, not me. Oh, I may get ornery once in a while when I'm wet, but your mistakes most commonly cause the accidents, not mine. If you fear landings, then respect them. If you respect them, then you will avoid complacency and stay prepared for all contingencies. Use your government issue, one-each, brain, but don't be afraid to call for some help or expertise. And then, perhaps, you will cease littering up my handsome surface with dismembered aircraft and related parts. ★

SAME SONG
DIFFERENT VERSE

MAJOR ROBERT M. SWEGINNIS
Directorate of Aerospace Safety

His ears were ringing, and his head whirled slightly as he squinted his eyes into the high altitude sunlight. The sight was familiar to the young fighter pilot, but somehow strangely different. No longer was he surrounded by plexiglass, dull black metal, dials and gauges; a stick in one hand, the throttle in the other. Instead, he stood alone on the clouds, suspended high above muted greens, browns, and blues of the earth.

As an old man walked down the clouds toward him, he forced his mind back, remembering the feel of his 'craft as he tried to bring it back under control. He remembered trying to coax a little more out of the 'craft, close to the ground, he was good . . . the best! But somehow the wings no longer responded to his commands. The nose sliced and the green earth filled the windscreen. And now he was here in this strange but familiar place.

"Hello, my friend," the old man said, snapping the young pilot's thoughts back to the present. "My name is Otto. Please come this way, and we will get you checked in and squared away." The old man led the way up the clouds toward a great gate in the sky. As they made their way toward the final destination, Otto explained that he had been an aviator in a much earlier time. It had been many years since he had handled a stick and throttle, and he was anxious to learn more of the wonderous advances th[at] had been made in the field [of] aviation since he left it more t[han] half a century ago . . . at the c[lose] of the Great War. As they wal[ked] he produced a scrapbook. Th[e pic]tures were somewhat faded an[d] worn, but lines still sharp and The pages of the book were fi[lled] with pictures of bi-winged, tai[l-]dragging machines from a tim[e] when aviation was still in its i[n]fancy. Many of the pictures w[ere] of crashes, and as they contin[ued] Otto provided a short story o[n each] picture.

"This is what remained aft[er] second solo. It was the sixth Albatross our class destroyed could have been considered a

man Albatross III trainer destroyed on student's second solo.

Another Albatross III. Pilot Walked away uninjured.

allies, of course. This
oss CIII had a maximum
of less than 90 mph, and a
ceiling of just over 11,000
derstand that training air-
ave changed somewhat."

s, I should say so," chuckled
ing pilot." Even the T-41s
starting in today can do
than that. And an ATC wing
nder wouldn't last two
if he lost six machines. By
, what happened on that
solo? Stall it?"

at's what some people said,
ways thought it was the
Ve had a little storm off the
nd I was in a hurry to get
About 5 meters above the
n short final I came down
t. One second we were

flying and the next *crunch!* I thought I would lose my eye-teeth. But those machines were strong, and I wasn't even scratched."

"Sounds like windshear may have gotten you. Even today we are still learning about it. Some folks think that quite a few pilot factor accidents were actually windshear."

"Otto nodded slowly, "Perhaps so, but so many other times the pilots just blew it. Here is another Albatross CIII. Lieutenant Ernst stalled this one while making a turn at low altitude. "Would you believe he walked away with no injuries?"

The young pilot's mind flashed back to his own crash, only . . . how long ago? He knew now he was dead, but somehow the idea was still foreign and not acceptable. He, too, had "lost it" at low altitude, but the results had been much different. "Did you have many fatalities in those days?" he asked, turning to the old man.

"Yes," the old man's expression was sad as he nodded "All too many, and although some were due to mechanical failures, many were so foolish . . . avoidable. Here is a Pfalz DIII that flew into the top of a hill at night. And this is what is left of an LVG CII that spun in. In those days we didn't carry parachutes, so there was no choice but to ride it in. But today I see so many newcomers who could have delayed their arrival if they had decided to go over the side . . . er . . . up the rail sooner. Why do they wait?"

This Pfalz DIII flew into hillside at night.

LVG CII that spun in.

Pfalz CIDS flown by German pilot P. Ernst crashed from 4,000 feet.

1Lt Heintz "went west" when he allowed this Albatross CIII to s
10 meters. He'd forgotten to fasten his shoulder harness.

SAME SONG continued

"I don't know . . . pride . . . fear of repercussions. A classmate of mine fought an F-4 all the way down after he departed. He delayed punching until it was too late."

As the old man turned another page he said, "Here are two more that stalled and spun in. We were not very good pilots then—very litle training, not much flying time, and such young pilots.

The young man looked down between a break in the clouds and thought a moment. "Sounds like a song I've recently heard down there. The crews are getting younger and younger, less and less experience, flying time harder and harder to come by. And everytime we have an accident . . . er . . . mishap . . . the board recommends restrictions on training."

As they approached the gates, Otto had time to turn one more page. "Ah, yes, this was airman Heintz's last ride. His engine was acting up, nothing really serious, but he came back to make an emergency landing. He had to land into the sun because of the wind. The squadron commander and wing commanders were out here to supervise the whole thing, ambulances and trucks all over the place. I ran

Albatross BII damaged during emergency landing at Genershein.

into Heintz just after I got up
He said he got so distracted b
the confusion on the ground I
forgot about flying the aircra
He ran out of speed and fell i
from about 10 meters. He sh
have lived, but he had forgot
to fasten his harness."

"Unnecessary cockpit dist
tions are still a problem. It se
that whenever you have a pro
the whole world wants to get
the act and help. I understan
the multi-engine drivers even
big brother looking over thei
shoulder during routine miss
and it seems that routine proc
sequenced into critical time p
of the mission have figured in
more than one crash."

The old man turned and ex
ed his hand to the young pilo
"This is where we part for no
The gent behind the desk will
you fill out the necessary for
issue you a new set of wings.
hope we can continue our dis
sion later.

"Although you have devel
new and faster aircraft you st
seem to be crashing for the sa
old reasons. We will have lots
time to talk about it, all the ti
in the world." ★

OPS TOPICS

JI

Meaconing-Intrusion-Jamming and Interference (MIJI) is any interference that blocks your ability to transmit or receive on an assigned radio frequency. Recently, an Air Traffic Control frequency was effectively blocked by loud, persistent music sounds. When the aircrew changed to a backup frequency, the center requested a radio check on the blocked frequency and almost immediately upon the aircrew's return to the original frequency and transmission, the unidentified music began again.

A thorough investigation revealed no clues as to the source of the culprit. But, the investigators recommended, "In future cases of such interference, the exact time should be noted. This will enable commercial broadcasters to identify exactly the equipment and frequencies that are in use and may be intermittently malfunctioning."

A quick in-flight or post flight review of MIJI procedures in the IFR Enroute Supplement will reveal the exact data required for a report. If you note your position and time at the beginning, the end, and most effective point of interference, you should be able to fill in all of the other required information on mission termination.—Capt Ted M. Thompson, Directorate of Aerospace Safety.

Y PLAN?
Y BRIEF?

An Army helicopter conducting a low level flight during field training exercises struck powerlines approximately 50 feet above ground level, severing the tail boom. The aircraft, of course, immediately ceased aviating. During the crash, one passenger was thrown clear of the wreckage and sustained fatal injuries. A second passenger received major injuries, and the crew escaped with minor injuries. The investigation revealed some alarming facts:

1. The pilot performed low terrain flight following without a thorough map reconnaissance of the intended flight route.

2. There wasn't a tactical map or a hazards map at the field site to guide unit aviators in safe mission accomplishment.

3. The pilot slept only 3½ hours during the 24 hour period before flight.

4. The copilot, flying during the mishap, was required to wear prescription lenses to correct a nearsighted condition (objects beyond 20 feet were difficult to distinguish). He wasn't wearing them at the time of the incident.

5. Inadequate passenger briefing on the use of safety belts and shoulder harnesses resulted in the fatally injured passenger's failure to have his shoulder harness secured. A proper briefing may have prevented his death. —Courtesy *Flightfax*.

Is this only an Army helicopter problem? No! Since November, two Air Force fixed wing aircraft on low level routes have hit electrical wires, causing substantial aircraft damage. Crew rest violations were factors in three recent mishaps. And lastly, when was your last comprehensive and effective passenger briefing? ★

USAF IFC APPROACH

MICROWAVE LANDING SYSTEM

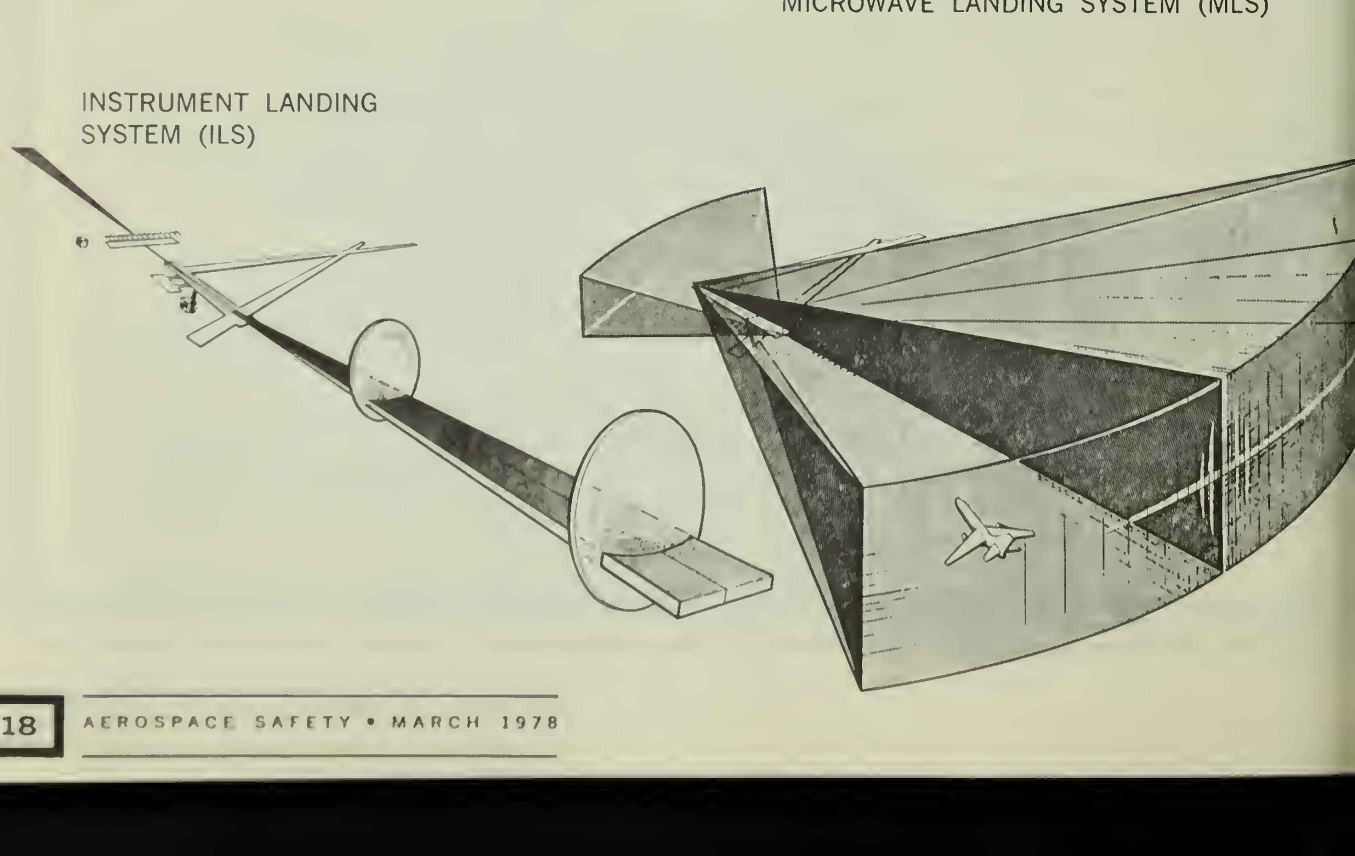
Most pilots will agree that landing an aircraft is the trickiest, if not the most challenging part of flying. When you add low ceilings, poor visibility, night, and/or rain to the approach and landing, the challenge increases rapidly. For many years pilots have relied upon two basic types of precision approaches, the Precision Approach Radar (PAR) and the Instrument Landing System (ILS). Both these systems have their individual strengths and weaknesses; however, the narrow band of course guidance in both systems severely restricts their potential to meet the requirements of future aviation growth.

In 1967, the Radio Technical Commission on Aeronautics (RTCA) formed a special committee to research and recommend an alternative approach aid that would expand the capabilities of the ILS and PAR. The committee recommended the development of a full-performance Microwave Landing System (MLS), capable of meeting all user needs, and having the ability to be tailored to specific aircraft and operational requirements.

Prompted by the RTCA committee recommendations, the US formed a joint planning group, consisting of the Federal Aviation Administration, the Department of Defense, and the National Aerona and Space Administration, for the joint develop and testing of a common civil/military MLS. S efforts were also initiated by other countries International Civil Aviation Organization (ICA presently coordinating these independent prog and will select the international standard in the future.

There are two basic types of MLS systems i research and development stage, the Time Refe Scanning Beam system and the Doppler system Time Reference Scanning Beam system sweep narrow beams across the sky, one from side to the other up and down. The aircraft's MLS e ment measures the elapsed time between succe passes by both the horizontal and vertical bea determine the aircraft's angular position wit spect to the runway centerline and its position lation to the selected glideslope. In the Dopple tem, the aircraft uses the difference between t ceived frequency and a reference frequency to mine its position. In either system the aircraft' borne MLS equipment interprets the signal dat presents the information for pilot action. Both tems contain integrated precision Distance Me

Figure 1



By the USAF Instrument Flight Center
Randolph AFB, Texas 78148

quipment (DME). Regardless of the MLS sys-
elected as the standard, we can look forward
lical changes and increased flexibility in ap-
n design.

most unique characteristic of MLS is its capa-
to provide a vastly expanded signal coverage
Figure 1 graphically illustrates a direct com-
n between ILS and an MLS with only ±40 de-
of azimuth coverage.

omparing the two, ILS course guidance provides
onal azimuth coverage horizontally through
6 degrees with course information valid to ap-
nately 18 NM. In contrast, MLS could provide
120 degrees of coverage with valid signal cov-
out to 25 miles (approximately 436 square
precision maneuvering airspace is provided
ne 80 degree azimuth and 654 square miles
ne 120 degree). Vertical ILS coverage provides
imately 1½-degrees of glideslope width with
n a 2 to 3 degree descent gradient. MLS, on
ner hand, provides a selectable descent gradi-
om the glideslope transmitter site of 0 to 20
s, so that any desired glideslope, or even seg-
d glideslopes can be flown. With the extremely
te integrated DME, the MLS also provides for
flexibility in designing and flying any number
e dimensional precision approach paths to the
runway. The MLS also incorporates limited
on missed approach guidance. Because it is
ct and light weight, the MLS will also provide
nprovements in portable tactical precision ap-
systems. Using MLS, it will be possible to set
precision instrument approach at a forward
ng location in a matter of minutes.

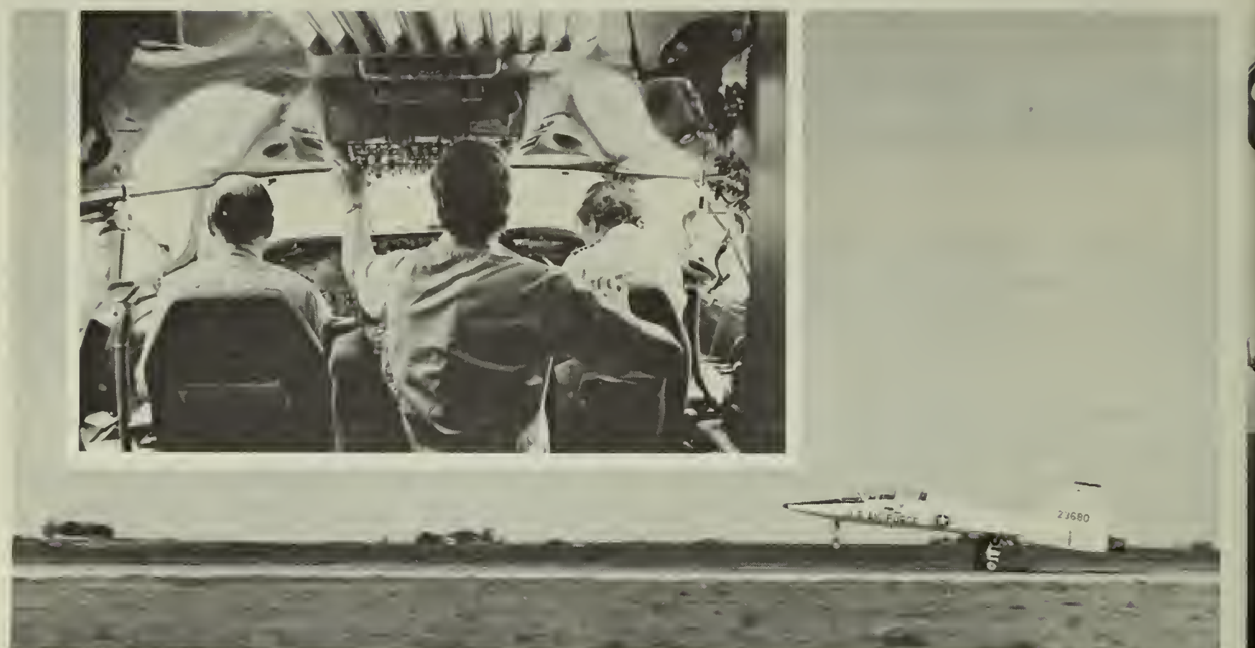
the implementation of MLS and the advanced
logy associated with the system, the complex-
ginality and utility of precision approach pro-
ill depend upon the level of sophistication of
e equipment, airframe limitations, and imagi-
of the approach designer. MLS will solve most
ILS and PAR deficiencies with more approach
ls available, improved signal integrity, in-
precision DME, and unlimited approach path
ty. Initial implementation is expected early in
80's with MLS co-existing with ILS and PAR.

MLS should be fully implemented as the single standard precision approach and landing aid by the year 2000. Although you won't see MLS procedures in AFM 51-37 for a while yet, it is the system of the future and many of you reading this article can expect to be using it before your flying days are over.

Q: I am being radar vectored to a final approach course. When the radar controller clears me for the approach, am I required to maintain my last assigned heading until intercepting the course?

A: The controller expects you to maintain your last assigned heading until intercepting the final approach course. However, if the assigned heading is detrimental to course interception (because of such factors as adverse winds or intercept angle) then the pilot should employ good judgment and common sense and change his heading to a more appropriate one.

As most of you probably already know, the Instrument Flight Center is in the process of being closed down. Some of you are probably wondering who you can call to confirm that you've won the case of beer you bet on that instrument related question you were arguing about the other day. Don't worry, you can still win your bet (or lose it as the case may be). The Flight Standards Division of the USAFIFC will be open until 30 June of 1978, and most of your questions can be answered there. For TERPs, call AUTOVON 487-4274. For pilot procedures/directives, call AUTOVON 487-4276. For questions on FLIP, call AUTOVON 487-4884. At the end of June FSP and FSF (the sections which look after TERPs and FLIP respectively) are tentatively scheduled to move to Scott AFB. FSD, the section which looks after pilot procedures/directives and interpretation of manuals has already been partially relocated at HQ ATC. The section there is responsible for AFM 51-37, AFR 60-16 and AFP 60-19 and can be contacted at AUTOVON 487-5835. As more information becomes available on the disposition of the various functions of the Instrument Flight Center, we will inform you through future "IFC Approach" articles. If you have questions on instrument related matters, please do not hesitate to call any of the numbers listed above. ★



Takeoffs And Judgmen

There is an old adage among pilots that anyone can make a takeoff; it's the landing that's tough. Statistics support the belief that there are many more landing than takeoff accidents.

But takeoff accidents do occur, and all too often they are the result of judgment errors. Errors in common tasks which are routinely performed before every flight. Errors which cause other pilots to shake their heads and say, "I can't understand how he could have made that mistake." Perhaps because tasks like performance data computation or pretakeoff checklists are so common, we tend to pay less attention to them than they deserve. As a result, special circumstances may be glossed over and no compensation made. The result, all too often, is a mishap.

A DC-8 on a cargo flight struck the ILS antenna and approach lights during takeoff from an airport in New York. The National Transportation Safety Board (NTSB) investigation found that the crew accepted a clearance for a runway which was too short for the aircraft takeoff performance capability under existing gross weight and weather conditions.

In that mishap the crew was very familiar with the airdrome. The company had a procedure which called for the station agent to prepare weight and balance and takeoff data for the flight. While taxiing out for takeoff, however, the crew elected to take a shorter runway due to reduced RVR on the preplanned runway. Normally, such a change would not be significant but, in this case, the crew neglected to check the aircraft performance and gross weight restrictions for the shorter runway.

The first officer, at the captain's request, did check the runway facilities chart and determined that the runway was "adequate" for use. Howeve
these facility charts do not c
tain limitation information a
consequently, the crew was
aware of their over-gross co
tion. In fact, the aircraft was
than 33,000 pounds overwe
for the conditions existing a
time of departure. The takeo
performance was such that
aircraft struck objects 1 foot
above runway elevation, 25
beyond the departure thresh
and 4½ feet above runway e
tion, 850 feet beyond the en
the runway. This crew should
realized they were exceeding
performance limitations of t
aircraft. They should have, b
they didn't. So, why did they
mit themselves to this margi
situation? There is no simple
planation. A combination of
tors all contributed: familiar
with the routine, the last mi
change in runways, reliance
outside party for planning. T
can and will change, someti

JOHN E. RICHARDSON
ate of Aerospace Safety

e or no time for recompu-
But this is exactly the
en we, as aircrews, must
alert.

times a combination of
set in motion by the
ck of attention or hurried
can build into a situation
mishap becomes in-

t of two fighters was on
tion training mission. At
te stop, the weather brief-
ated that, on departure
would encounter light
e flight leader did not
this information and de-
take off with engine inlet
up. Shortly after the for-
ntered the clouds, both
xperienced compressor
d flameouts due to ice
ation on these inlet
Neither crew could get
and they both were forced

imes there are factors
n the crew which set the stage for a mishap. In one case, lack of adequate planning led to a situation where the crew's capabilities were overextended, and they committed several errors resulting in a fatal crash. In another case, a flight lead overestimated the proficiency of his wingman. The flight took off in marginal weather without adequate briefing on lost wingman procedures. Shortly after takeoff, lead made a fairly abrupt turn. Number two was not able to keep up, lost sight of lead, then became disoriented and crashed.

Yes, takeoffs are normally easy. And because they are, we tend to overlook the potential for mishap. Such an attitude leads to the kinds of errors we've talked about. Aircrews are the ones who can do most to prevent takeoff mishaps.

Knowledge is the key. Know what each situation entails and be sure that all the pertinent factors are considered. Then takeoffs will continue to be easy. ★

THE

REX RILEY
Transient Services Awar

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
EGLIN AFB	Valparaiso, FL
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
ENGLAND AFB	Alexandria, LA
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AL
PETERSON AFB	Colorado Springs, CO
RAMSTEIN AB	Germany
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
TORREJON AB	Spain
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
McCONNELL AFB	Wichita, KS
NORTON AFB	San Bernardino, CA
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RICHARDS-GEBAUR AFB	Grandview, MO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
CARSWELL AFB	Ft. Worth, TX
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayetteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND

EFFECTS OF RUNWAY GROOVING

Since their introduction, jet aircraft with their higher landing and takeoff speeds and high pressure tires have had problems with incidents/accidents resulting from loss of traction between the aircraft tire and the pavement surface. Aircraft systems, as well as pavement surface characteristics, have been modified to reduce the probability of loss of control resulting from lower traction.

Aircraft systems such as antiskid and modified nose wheel steering are two of the manufacturers' approaches to maintaining aircraft ground directional control. The remainder of the solution falls to pavement engineers to provide the best possible surface and to flight crews to use proper care when operating on wet, flooded, snow and slush, or ice covered runways.

This article will deal with one method of improving traction between the aircraft tire and pavement surface. Most of you are familiar with a type of grooving as it is used on highways. These grooves are normally longitudinal, i.e., cut parallel to the traffic direction, and are relatively narrow and shallow. In contrast, the grooving used on runways is approximately ¼ x ¼ inch and placed perpendicular to traffic flow. The primary purposes of these grooves are to serve as routes for the water to be expelled from under the tires and, in the case of transverse runway grooving, to help remove bulk water from pavement surfaces.

The British first used grooving to improve traction on their roads in the early 1960's. Since that time, grooving has been used on all types of pavement to help improve available traction. In the US considerable research has been and is being conducted to determine the best groove pattern (see Figure 1 for examples of patterns now in use). Most authorities now agree that a ¼" x ¼" groove on 1" to 1¼"

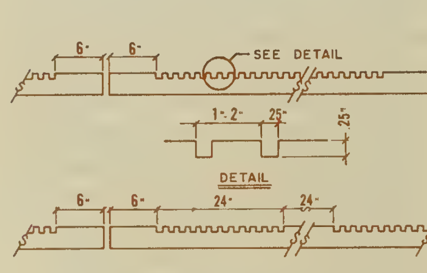


Figure 1
Typical Grooving Patterns

centers is the best pattern
considering only traction. Hov
when cost is considered, this t
groove pattern may be more t
actually required under most
ditions.

The FAA is continuing li
work to determine the best co
mise between cost of constr
and traction requirements. Th
terns in Figure 1 have all been
uated by the AF Standard Ski
sistance Evaluation System
found to have good traction c
teristics. Figure 3 shows som
fore and after results which in
the effectiveness of grooving.
a civil engineering aspect, gro
is probably the easiest meth
improving traction on run
However, there are two USA
itations of which operators s
be aware. First, a HQ USAF
letter (25 Sep 75) and AF M
91-23 limit grooving to b
1500 feet from the threshol
to a maximum width of 140
Secondly, it is AF policy n
groove asphaltic concrete (AC
faces.

The Air Force policy lette
written as the result of many
plaints about the reduced ti

CAPTAIN DANNIE O. BURK • Air Force Civil Engineering Center, Tyndall AFB FL

Figure 2

cuts showing wear as tire wears—not
g or spreading to other ribs. B-52G
19 landings on .25 x .25 x 1" grooved
(Photo from Pavement Grooving and
Studies, NASA SP-5073, PP. 176.)

by chevron cutting (see Fig-
which is a product of forces
ated at touchdown on a
d surface. The tire industry
with the USAF and airline
ies studied this problem and
bber compositions are now
which reduce tire susceptibil-
chevron cuts. However, the
mpositions did not eliminate
etely the chevron cutting
n, and the policy restricting
oving to the non-touchdown
f the runway was initiated.
discusion of the potential
problems which result from this restriction see the Nov 76 *Aerospace Safety*.

Although the 140 ft (42.7 m) maximum width is primarily a result of economic considerations, it is wide enough for any aircraft to land and maintain track. On wide runways the ungrooved width is primarily for outriggers which do not require high traction surfaces. Still, skid resistance does differ at the juncture of the grooved and non-grooved pavement surfaces. This condition is not inherently unsafe as long as standard operating procedures are used. If non-standard procedures are implemented during an emergency landing or takeoff, then it is of utmost importance that aircrews know the locations of differing skid resistance surfaces.

The policy of not grooving AC surfaces stems from the probability that surface grooves would be susceptible to flowing back together or shearing of the lands (area between the grooves) during sharp turns by taxiing aircraft. While the AF does not groove AC as a standard practice, the civil airports in the US and several AF runways have had their AC surfaces succesfully grooved. The wear life of the grooving and the AC engineering characteristics prior to grooving are not generally known.

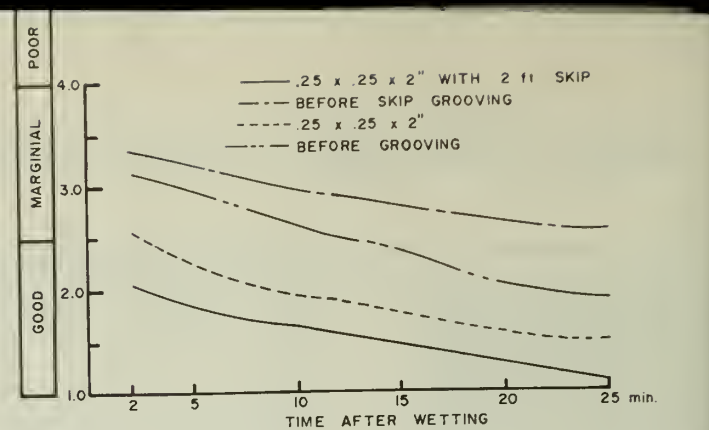
There are two primary methods of grooving runways. The first and most prevalent is sawing the grooves in existing pavement with diamond saw blades. This method is used on older pavements in need of corrective action to improve skid resistance. The second method, which is used in new Portland Cement Concrete Pavements, is forming the grooves during construction while the concrete is still plastic. This type of groove drains somewhat slower than sawed grooves because of the rougher drainage channels. However, this slower drainage is not considered to be a significant problem for AF aircraft operations.

Effects of Runway Grooving continued

EFFECTS ON AIRCRAFT TRACTION

It may seem at this point, that a great many words have been expended that apply only to the civil engineer, but operators must also look at the benefits as well as the potential problems of any surface treatment. The aim is to gain an insight into the factors which govern their particular situation. With the general engineering view behind us, let's look at the characteristic advantages and disadvantages of grooving from the viewpoint of the aircrew. As mentioned earlier, the primary reasons for grooving a runway are: (1) to get the bulk water away from the runway as fast as possible and, (2) to provide alternative methods for water to be expelled from beneath the tire as the aircraft transverses the runway. Grooving provides bulk drainage by providing the shortest path off the runway and in most cases the path of least resistance, when wind and surfaces texture are considered. When the rainfall rates are too great for the drainage capabilities and the water depth exceeds the tops of the pavement aggregates, grooves function exceptionally well as an added path for the water to escape from beneath the tire. This reduces the dynamic water pressures under the tire which could cause *dynamic* hydroplaning.

While the probabilities of *dynamic* hydroplaning have been essentially eliminated, assuming grooves are clear and in good shape, the potential for *viscous type* hydroplaning or reduced surface traction resulting from partial *dynamic* hydroplaning still exists. Loss of traction on a grooved runway resulting from *partial* and/or *viscous* hydroplaning is considerably less than that expected on an ungrooved runway. *Viscous* hydroplaning results from poor surface microtexture



STOPPING DISTANCE RATIO (SDR) RESULTS BEFORE & AFTER GROOVING

Figure 3

caused by a polished aggregate and/or rubber build-ups. Figure 3 provides comparisons between some typical grooved and ungrooved runways. As the figure shows, there are dramatic improvements in the results obtained after grooving.

Having shown the differences that grooving can make in skid resistance, I will review some NASA test data which also substantiates the effectiveness of grooving. These tests included both a Convair 990 and an F-4D aircraft (data came from *Pavement Grooving and Traction Studies*, NASA SP-5073, Nov 68).

Figure 4 is a pair of graphs showing ground speed, expressed as a percentage of the theoretical dynamic hydroplaning speed, vs cornering force as a percentage of the dry cornering force. Figure 5 is a series of graphs showing a plot of ground speed vs braking friction coefficient during maximum braking efforts by the aircraft. Figures 4 and 5 both show the improved traction that can be expected as a result of grooving a runway. This improvement easily justifies the
quired for cutting groove
hance safety.

Review of these figures a
one additional item of impo
the difference between dry
friction and wet grooved
While this difference is
great as when the paveme
grooved, it is of sufficien
tude that under certain air
weather conditions, loss o
control resulting from parti
planing is a possibility.

Combinations, such as
high crosswinds and a we
runway, are not likely to
mon occurrences. Howeve
circumstances begin to com
crew should plan accordi
ure 7 is included primari
formation, to show the e
smooth tires can have o
traction during wet runw
tions. Having discussed w
conditions, I will now b
cuss the effects groovin
other runway surface con

Slush covered runways a
common, but when they

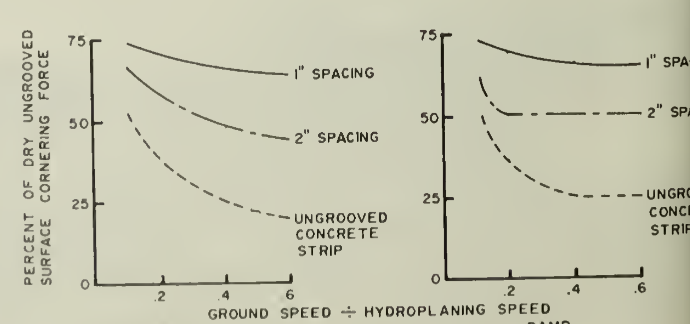


Figure 4

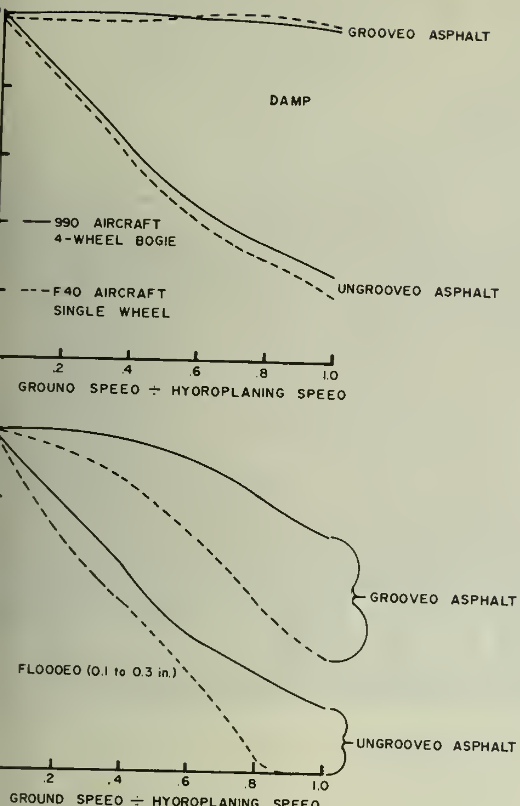


Figure 5

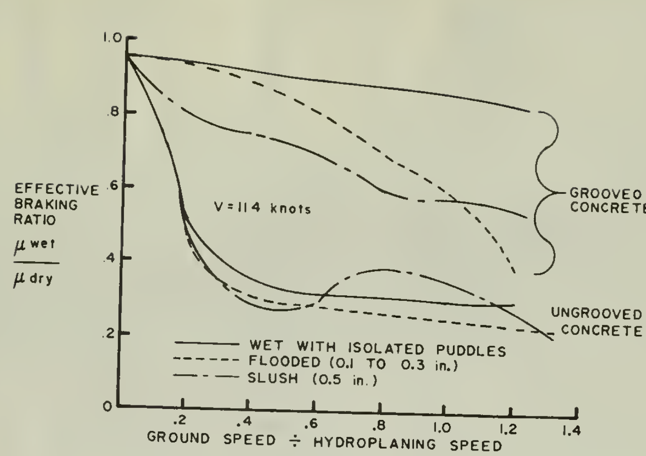


Figure 6

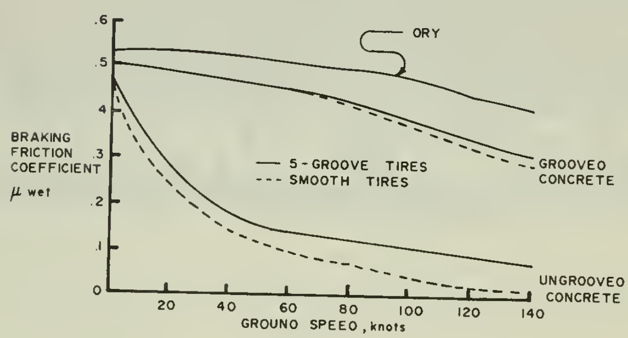


Figure 7

mproves the movement n from beneath the tires oes with water. Figure 6 oss of braking effective- sults from a slush cover- mpares the results with reduced drag resulting provides an added safety vever, since groove pat- he exact drag reduction pecifically stated.

Runway Surface Condi- is ice or snow, traction enhanced by grooving. e that accumulates on ement when the temper- freezing (−5°C to 0°C) y breakup faster with on an ungrooved run- Additionally, some air- rs claim benefits such elting and clearing of en grooving is used. able, but as yet has not ented.

collected to date indi- oving provides a safer g wet, flooded, or other runway surface conditions*. The potential disadvantages of this type of surface are minimal to both aircrews and pavement maintenance crews. But, as with any safety system, it can be negated by non-standard or careless operations. ★

**We must, as aircrew members, maintain as a part of our memory, a general knowledge of: (1) the types of surfaces a runway may have, (2) the kind of traction that each surface affords and, (3) the runway environmental weather conditions immediately prior to landing (within 2 minutes of landing). The first two items are a part of the standard format of each skid resistance evaluation report and should reflect capabilities of the runway if the report has been accomplished wtihin five years and the pavement has not been resurfaced. Beyond five years, the wear and deformation of the runway may have completely changed the traction characteristics. The last item, runway environmental condition immediately prior to landing, should come from tower advisories or the RAPCON.*

DEFINITIONS

Macrotexture—The large scale surface texture which allows drainage of water from under a tire.

Microtexture—The smaller irregularities on individual surface aggregates which provide the major portion of the friction between the tire and pavement surface.

SDR (Stopping Distance Ratio)—A measure of the traction on a pavement surface. Wet stopping distance divided by a standard dry stopping distance of 300 feet. Distances are measured by a diagonally braked vehicle which initiates stopping at 60 mph (96.6 kmph).

I Can Survive(!)(?) (CHOOSE ONE

SSgt ALAN E. ERICKSON • Operations and Requirements Branch
3636th Combat Crew Training Wing (ATC)—Fairchild AFB WA

There seems to be a consensus among aircrew graduates of the USAF's Basic Survival School: "Thank God it's over," and "I'm sure glad that it's a once-in-a-lifetime course."

Those of you who are now smiling and nodding in agreement or shouting "Amen!" please do a little honest self-evaluation. What if our nation went to war tomorrow? If you should find yourself on the ground, could you effectively put to use the skills and knowledge that would be necessary for evading unfriendly forces and staying alive for an extended period of time?

Right now some of you just mumbled something about guaranteed rescue within 72 hours of getting on the ground. Not necessarily so! With recent developments in surface-to-air missiles (both vehicle-mounted and hand-held) slow moving rescue aircraft could have a very difficult time getting to you. So you might have to move a long distance to find a better position for recovery.

For those of you who think that you will be dead or captured if you're not rescued quickly, there is not much that can be said because you have already given up. You need a strong will to make it back.

Some will die. Some will be captured. Some will be rescued. What category will you be in? That can be greatly influenced by your attitude and prior preparation.

Survival schools introduce you to what you need to know, to better your chances.

Continuation training and intelligence briefings refresh your memory and keep you informed of new developments. The immunization program, yearly physicals and the aerobics program try to ensure that you are healthy enough to undergo the rigors of survival living.

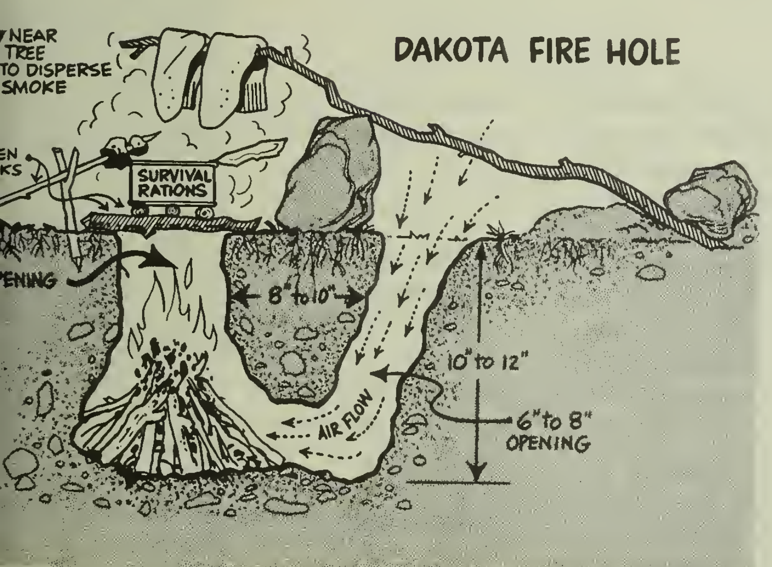
What you get the least exposure to is field practice of survival skills. Remember the "o
in a lifetime course" gave you
only four to six fast and furiou
days of application of the skil
which may determine which c
of the previously mentioned c
gories you will fall into.

Do you attempt to run the
aerobics test each year withou
any prior preparation? Some
you do. Frequently some fail c
are miserably sore for the ne
week. "So what if I don't mak
My friend the timekeeper wil
the time, or, at worst, I'll have
retest or attend a reconditioni
program." In the combat surv
environment there is no paddl
or retest. Any test of skills is f
keeps.

I'm not proposing attendin
survival school again. I am pro
posing that you practice the s
taught to you at basic survival
school. If you hike, hunt, cam
fish, ski, or go on picnics you
perfect opportunities to pract
some of those skills. For exam

d of starting your next
cue or fireplace fire with
pint of lighter fluid and two
s of paper, try finding
l burnable materials in your
a vacant lot or a nearby
Then prepare to ignite them
ly one match or a flint-like
g device (non-zippo) that
get at the local sporting
store. If it is raining when
ther materials, so much the
because in an evasion
n that would be one of the
imes to have a fire. Small
s of diffused smoke would
ith the fog and mist. At
mes you may need the heat
ing effect of the fire.

u think you'd never have
uring evasion, forget the
imate of SEA and imagine
ern latitude in the late fall,
or early spring. If you're
with rain or wet snow
eed a fire to survive. Hypo-
can kill you almost as
he enemy. A hidden
hole" fire (see illustra-
ght be the only thing
you and death. If faced
t situation, you'll fare
etter if you had practiced
Remember, no padding
t.



You may have heard that a person can survive for 30 days without food. This may be true in a warm climate if the survivor is doing absolutely no work. Not so for an evader in a cold climate. Food means calories, which equals body heat, energy, and life. The general purpose ration that the USAF puts in survival kits today contains approximately 900 calories per can. If you have a seat survival kit, you may have one or two cans. POWs in North Korea existed on a diet containing approximately 1600 calories per day, while in confinement. Most had extreme weight loss.

Evading is hard work and much more so if it occurs in a cold climate. The active evader needs all of the food that he can get. The question of food procurement could be extremely important. Check with the local game department to see if it is legal to take pest animals, such as gophers and ground squirrels, by snaring. If so, get some thin, flexible wire, nylon string or fibrous bark that can be made into simple snare loops. Next ask some local farmer if you can catch some of his varmints. If you explain your reason and show him that your snares are harmless to his livestock, you may make a good friend and find a place to practice and picnic at the same time.

You might try getting vegetables out of "your own" garden at night without leaving evidence of your activity. Check the next morning.

You might find some excellent plant food books or identification cards at your local sporting goods or book store. When hiking or fishing, take them along and try some easily identified plants like dandelion or cattail. If you're not absolutely sure what a plant is, discard it or go through the edibility test procedures.

Instead of walking down the trail to your favorite fishing spot, try creeping quietly through the brush. In this way you can practice evasion movement and good fishing techniques at the same time. It might get you the biggest fish in the hole.

The next time that you go hunting or hiking would also be a good time to practice evasion techniques. If you hunt by stalking, or walking, try to do it quietly and without leaving many tracks. Stop, look, and listen often. Turn around and check your route of travel to see how you did. You should have selected a route that was not obvious, walked in the shadows, and been quiet. If you did well, chances are you ran into game because that's how the animals avoid/evade you. Additionally, avoid leaving tracks in the open, walking in soft soil, breaking branches, turning over rocks, matting down grass, or dropping any manmade objects.

If you sit still to hunt, select a secluded area. Approach it very carefully so you don't leave any evidence of your passing. Gently part the brush and slide through it. Do not "bull" your way through,

Survival! I can survive (!) (?)
continued

bending and breaking leaves and branches as you go. Position yourself so that you have rocks, logs, brush and/or branches to conceal you as well as protect you from the elements. If you have to use manmade materials for protection, make sure that they are not visible from above or outside of your shelter. Rearrange the natural materials so that your protection is increased and so that you can observe the approaches to your position. The shelter should look like everything else in the area, not like a brush heap. This probably means that it will have to be quite small, low, and irregular in shape in order to blend with the surrounding terrain.

If you get cold, you might try building a small, smokeless evasion fire in a Dakota hole. Use dead hardwood of little finger size or smaller. Be careful not to start a forest or grass fire.

Just prior to your next mission, look into a mirror and ask yourself a few questions: What is bright and shiny on my uniform? Is my clothing sufficient for the environment I'm flying over? Do I have a personal survival kit on my person? Being prepared means more than having the most current knowledge. No one should expect to functionally use skills learned in a "one time only" training situation and then expect to recall his proficiency after three years or more of no physical practice. You can't be at a desk job for several years and then jump back in the aircraft and expect to fly without practice!

Survival under evasion conditions makes severe demands on survivors. The basics of firecraft, food and water procurement, shelter, and the like can be put off for some time because of enemy activity. Eventually these needs will have to be met.

Don't over saturate yourself by trying too much practice all at once. This could turn you sour on the whole idea. A little bit at time, as the situation comes should help maintain some p ficiency.

Your family might enjoy p ticipating and learning valua skills at the same time. Chil make relentless aggressors game of "hide and seek" w a picnic. Your wife or girlfrie may not mind your slowness starting the fireplace or cam when you explain to her your reason and the need for the ulous steps in firebuilding. amount of practice you get i to you.

Are you physically and ps logically prepared to cope w such harsh and demanding tions? Remember there is no padding, retesting, or recon ing program in combat. Get own insurance—practice wh basic survival school preach

Any questions or commen about this article should be ferred to SSgt Erickson, 363 CCTW/DOTO, Fairchild AFB 99011, AUTOVON 352-547

NEWS FOR CREWS

continued from page 1

in non-rated career areas should anticipate returning to rated duties at the completion of their current Supplement tour. The controlled return to rated duties has several advantages, including: (1) ensuring a young, responsive supplement resource which is truly capable of augmenting contingency forces, (2) protecting the rated credentials and viability of the individual Supplement officer, regardless of total "gate" credit, and (3) providing the opportunity for duty in support career fields to as many rated officers as possible.

With the Supplement of the future reduced to approximately one-third of its current size, competition for duty in support career fields will be keen. If a Supplement tour is in your personal career plans, communicate your desires via the AF Form your resource manager at AFMPC.

ABOUT THE AUTHOR

Captain Carl L. McPherson, Chief, Ra Supplement Section, has been assigned to Military Personnel Center as an action offi of the PALACE SCOPE management team Rated Supplement Section since Septem 1974. After graduation from the Air Force Ac emy, Captain McPherson flew C-130Es fr CCK AB, Taiwan and Dyess AFB, Texas prior a tour as an air weapons controller in Korea.

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ATES AIR FORCE

Vell
Done
Award

ented for
ng airmanship
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ance during
ous situation
for a
contribution
the
tes Air Force
t Prevention
ogram.

First Lieutenant David A. Deptula

555th Tactical Fighter Training Squadron
58th Tactical Training Wing
Luke Air Force Base, Arizona

On 29 June 1977, Lieutenant Deptula was nr two in a flight of two F-15s flying a syllabus training mission. He had 18 hours in the F-15 and was just completing the conversion phase of training. Three minutes after takeoff, climbing through 6,000 feet MSL, he heard a bang followed by the illumination of the left engine fire light. Lieutenant Deptula initiated the in-flight fire emergency procedure, including engine shutdown and fire extinguisher discharge, and called for his flight lead to join up for support. The flight lead visually confirmed the aircraft was still on fire and appeared to have some damage around the left aft section. Lieutenant Deptula turned towards Luke AFB, dumped fuel, and made a controllability check to determine that he could land the aircraft. To avoid any danger to personnel and to keep property damage at a minimum in the event an immediate ejection was necessary, he requested a landing on a runway which had a relatively clear approach. Eight miles on final, the right engine overheat light and the left bleed air light illuminated simultaneously, further complicating his situation. Lieutenant Deptula was now down to two options—eject or continue the approach. He elected a single engine straight-in approach which was flown to a successful landing. Crash recovery personnel prevented further fire damage by quickly extinguishing a residual fuel fire as Lieutenant Deptula ground egressed from the aircraft. Lieutenant Deptula, although relatively inexperienced in the F-15, safely returned the aircraft after experiencing in-flight fire and aircraft damage. His superior airmanship, prompt reaction to a grave in-flight emergency, and professional competence resulted in saving a valuable aircraft and averted possible injury or loss of life. WELL DONE! ★

aerospace

SAFETY APRIL 1978

HIS ISSUE

Tag With Treetops and Tanks

IT IN THE SPINICH

Bullwinkle and the Gang

Taxiing

CTURED FAIRY TALES

AR DISTRESS

Which Way the Wind Blows

UNITED STATES AIR FORCE

aerospace SAFETY

THE MISSION - - - - - - SAFELY!

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, US

APRIL 1978 AFRP 127-2 VOLUME 35 NUMBER
34

FINITION: SPINACH—
A potherb of the
goosefoot family

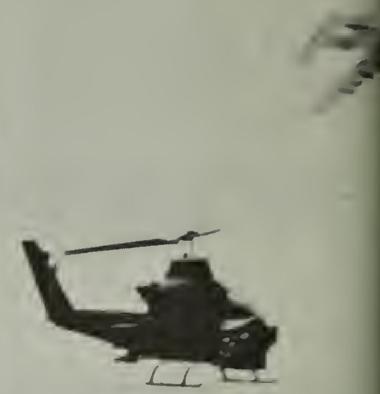
SPINICH—
Tactical Shrubbery

Dynamic integrated training and tactics development scenarios such as Red Flag and JAWS (Joint Attack Weapons System) are today's methodology to increase readiness and defeat the threat.

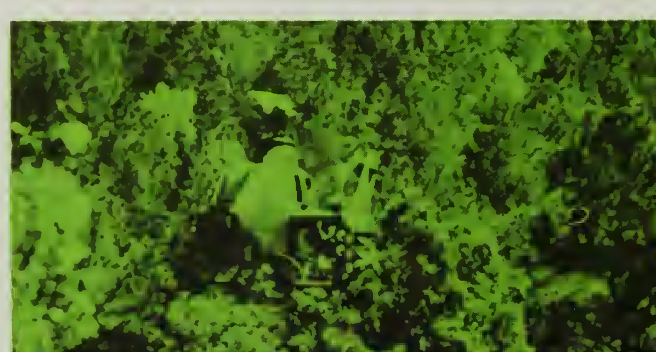
The "Spinich" is defined as that airspace from ground level to 300 feet AGL. A helicopter operating in this space owns that area from the treetops (spinich) down, while an attack fixed-wing aircraft (such as the A-10) owns that portion from the "spinich tops" upward. If the target terrain does not include tactical shrubbery, then survivability is reduced due to inability to use terrain masking (hiding in the shrubs). While using this technique, a qualified helicopter jock can fly around trees with "minimum" blade clearance on both sides. Similarly, an A-10 pilot can sustain altitudes of 100 feet AGL or lower.

JOR TONY HELBLING, Jr. • Directorate of Aerospace Safety

DO IT IN THE SPINICH



DO IT IN THE SPINICH continued



This joint scenario is the epito of demanding flying resulting in l of sweat and adrenalin flow! I midair situation is sensed by a he copter or attack aircraft, the cho per "takes it down" while the A- goes up.

In order to properly train a qualify aircrews, the pilots are posed to a repetitive series of l altitude missions and successfu demonstrate proficiency at incre ing levels of difficulty (sustair periods of low altitude-close cle ance maneuvering). With this me odology, our pilot is trained for maximum degree of low level p ficiency (given increased readin as the prime driver).

When the "balloon goes up" a the tanks of the Warsaw Pact ru

nto friendly territory, we aren't g to have time to prepare or h up on low altitude tactics. n you fly an A-10 with a wing of 57 feet, at a sustained alti- of 100 feet AGL and below, had better have your priorities d out *before* you break into 5G turn. You just don't have to learn that degree of profi- y on a short notice basis.

ır job as operations supervisors ensure that our training pro- s do this. For instance, does ead-in training program com- ent the primary role of the fol- on combat aircraft? What type w altitude lead-in training do eed? Should an A-10 pilot can- e be learning the same basic uvering techniques as a crop duster? (Minimum distraction techniques and eyeballs out of the cockpit.)

In dynamic, integrated joint weapons scenarios, when fixed-wing aircraft are working within a few meters of helicopters, there is little room for error. The slightest distraction or lack of in-flight priorities can result in a real bad scene for both Army and Air Force aircrews.

When we look at realistic training such as "Red Flag," we see a slight increase of aircrew/aircraft losses as compared to previous loss history over several years. More dramatically, we see a substantial increase of realistic training which is realized by the higher proficiency level of increasingly demanding training tasks such as "pop-up" attacks, and reattacks.

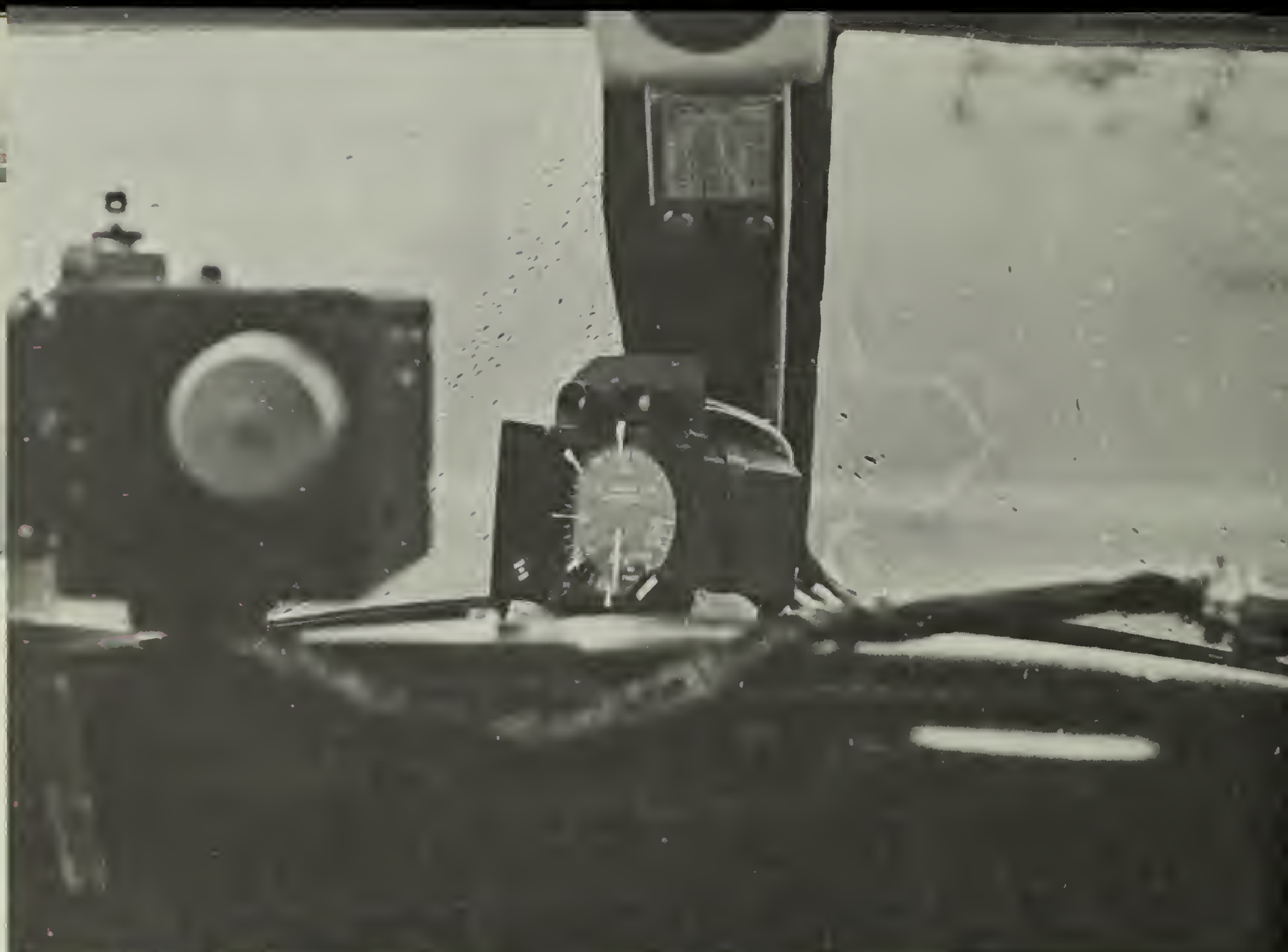
When we assess an aircraft loss on an "each case basis," we have to apply all the preventive measures we can *short* of interfering with our readiness goal.

At the year's end, when we analyze the annual statistics and compare losses versus training/readiness gains, we can justify our losses provided we have done all in our power to eliminate training deficiencies and bolster our training programs.

Previous theories of accident prevention such as:

- raising minimum altitudes,
- eliminating formation landings,
- reducing ACM/DCM exposure

just won't "hack it," given the requirement of increased readiness. ★



Runway Conditio

CMSgt GEORGE M. HORN • Air Weather Service, Scott AFB IL

With its engines running and windshield wipers wiping, a T-39 waited for takeoff clearance while a series of rainshowers wet isolated portions of the airdrome. A curious passenger inquired about the delay. The pilot responded, "We are waiting for the weather people to get out there and declare the runway dry." He continued to explain that the T-39 needs a dry runway before it can take off on a runway shortened by construction. Since the curious passenger was a "weather people," he knew that responsibility for determining the runway condition does not reside in the weather shack. He wondered how much of the aviation community was confused about how runway condition is determined and disseminated.

An informal poll showed that many pilots were unaware of how runway condition was derived, let alone relayed to the cockpit. This is understandable considering that runway condition is only one element of many occupying a pilot's mind before making a takeoff or landing decision. However, since the aircraft's contact with the runway surface is one of the more important aspects of flight, runway condition is of more than passin significance; pilots should know how it is determined as well as h it is passed through the inevitabl channels to the user.

Before we discuss where "run condition" comes from, we shoul review what it is. "Runway condi tion" is composed of two separat elements: "Runway Surface Con tion" (RSC) and "Runway Condi tion Reading" (RCR). RSC tells you what's on the runway (water snow, ice, slush) while RCR (a number from 02 to 26) provides index to the relative braking effi ciency of the runway surface whi

or snow covered.
e chief of airfield management ked (by AFR 55-48) to deter- both values (RSC and RCR) lisseminate them to local agen- uch as the tower, RAPCON, ommand posts. Base Opera- also passes RSC and RCR, in l form, to the base weather n for transmission on longline ier communications networks ubsequent use in aircrew ier briefings. In certain situa- Base Operations may use the weather dissemination system lly an autowriter) to relay run- condition to agencies with on that system.

nway condition is determined rsonal inspection either by Operations people or the Su- sor of Flying (SOF). RSC is de- ned visually. Determining RCR a little more effort and oc- nally some daring. A device a "James Brake Decelerom- or similar equipment is ted in a "ground aerospace e" (usually a truck), and the , after attaining the required rder directed speed, attempts on the portions of the run- n question. The average maxi- locked wheel deceleration without the vehicle coming to plete stop is the number re- d as the RCR. The better the cient of friction, the higher the erometer reading. A dry run- hould coax a "26" from the e, for example, while a sheet will get more response from iver than from the decelerom- The runway inspector checks e entire length to determine a entative value and also in- ramps and taxiways.

en all the data have been ed, the decelerometer oper- asses it to Base Operations. Operations then relays the in- tion for the runways, ramps, xiways around the base for diate use. From that dissemi- , the base weather station transmits only the conditions of the runway (in coded form) as part of the weather observation and uses the information in local aircrew briefings. When base weather is advised of a change to the existing runway condition, they transmit it as a special weather observation and subsequently include it as a remark in each succeeding hourly weather observation. In this way, it is transmitted to all other USAF bases and used by weather forecasters there as an important part of the flight weather briefings they provide.

As written on your weather briefing form, runway condition may look like these examples: "WR//" means that the runway is wet. Note that an RCR is *never* included with a wet runway report; joint USAF and NASA tests have shown that RCRs determined on wet runways are invalid and should not be used to predict stopping distances. RCRs determined on other surfaces, however, can be used as reasonably accurate stopping distance estimators. "IRO5P WET" means that there is patchy ice on the runway, the remainder is wet, and the RCR in the ice covered areas is 05. "LSRO8P DRY" means that there is loose snow in patches, remainder dry, with an RCR of 08. The addition of the remark "SANDED" tells you that the engineers have provided some sand for your braking convenience.

Runway Condition Reading (RCR) is measured by James brake decelerometer when surface is covered with ice or snow but not for a wet runway report.

An encoded runway condition of "RCRNR" means that Base Operations is closed and no one is available to determine or disseminate a runway condition. Since weather observers at such bases have been instructed to transmit this remark whenever the runway is anything but dry, you may assume some sort of precipitation or ice to be present whenever you see it. By comparing the RCRNR report to the reported weather observation, a rough assumption of actual runway condition can be made.

At some Army airfields and Air National Guard bases, decelerometers are not used and RCRs are not reported. At some of these bases, RSC is still reported, but RCR is replaced by slashes and ICAO braking action remark is added, e.g., "PSR// BA MEDIUM." This, so far, is how runway condition is determined and disseminated today. To take a brief look down the road (or runway), there's a strong possibility that runway condition will follow the inevitable move towards automation. There are systems available and operational today that transmit real time *runway surface condition* data from sensors buried in the runway surface to digital readouts in Base Operations. It is possible to totally automate these systems for instant, hands off, local dissemination and longline transmission. However, a totally automated runway condition is still a problem in that there is no provision for providing an automated RCR.

Runway condition is significant to all aircraft operations except perhaps VTOLs and helicopters. It's important that pilots know how it's derived, relayed, and applied to individual aircraft characteristics. For further information, see AFR 55-48, Chapter 5, or stop in for a chat with your friendly chief of airfield management, SOF, or weather person. ★

Q. In discussing crosswind corrections in the holding pattern, AFM 51-37 refers to double and triple drift corrections. Exactly how do you apply these techniques?

A. The method most frequently used to correct for crosswinds in the holding pattern is to steepen the downwind turns and shallow turns into wind 1° for each degree of drift correction required to maintain the inbound/outbound track. These bank corrections should be made from either the bank angle necessary for a standard rate turn or 30°, whichever is the smaller. The procedure can be depicted as in Figure 1.

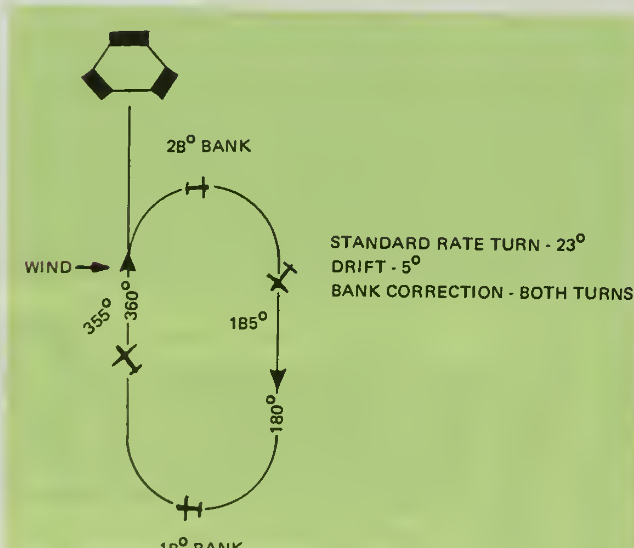


Figure 1

However, if the aircraft's true airspeed is in excess of 210 knots, the bank angle for a standard rate turn becomes greater than 30°. In this case, the pilot should use 30° of bank as the reference bank angle for making corrections. Notice, he now cannot steepen his downwind turn. Since he cannot compensate for the wind's effects during this turn, the aircraft will be flown wide, and merely shallowing the turn into the wind will not place the aircraft on the inbound course. The use of a double drift correction on the outbound leg, as shown in Figure 2, is a method that will correct this problem.

In a situation where the required drift is large enough (greater than 15°), the pilot may not be able

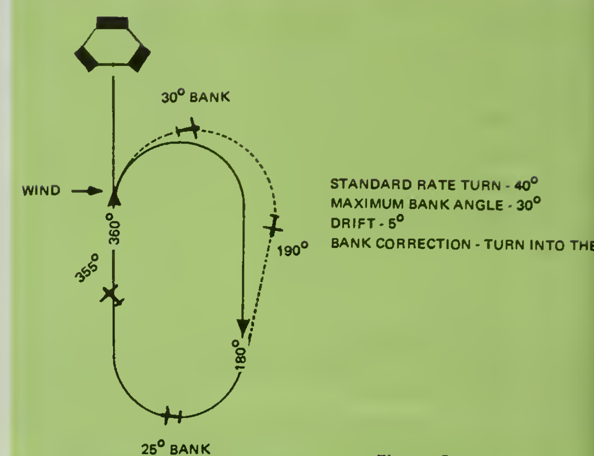


Figure 2

to shallow the turn into the wind sufficiently to pla the aircraft on its inbound track. Use of the tri drift method on the outbound leg can be emplo in this situation. This method, which is illustrated Figure 3, has an added advantage in that 30° bank is used for all turns.

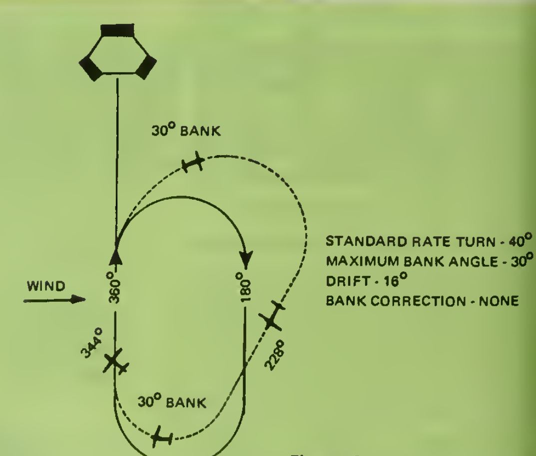


Figure 3

POINT TO PONDER—THE INSTRUMENT TAKEO

Most pilots would agree that the takeoff is o of the most critical phases of flight. It is even mo so when poor weather dictates the necessity for p forming an Instrument Takeoff (ITO). Since the Force has lost several aircraft in recent years duri instrument takeoffs, perhaps a brief review of I techniques is in order.

By the USAF Instrument Flight Center
Randolph AFB, Texas 78148

Vhen can the pilot anticipate an ITO? Certain ather conditions will, of course, necessitate an ITO weather alone may not be the determining factor. ht takeoffs over water or desolate areas may re- re the mental preparation necessary for an ITO. craft configuration and performance in certain craft (a heavyweight KC-135 for example) require precise pitch attitude and airspeed control that associated with an ITO.

Preparing for the ITO begins long before the ac- takeoff. A thorough study of all available SIDs, roach plates, obstacles, NOTAMs and weather ditions should be accomplished when the possi- y exists that an ITO will be flown. The study of s and terrain might indicate a certain climb dient must be maintained to clear obstacles. If climb gradient can be maintained normally, is ossible after the loss of an engine? Always check roach plates and NOTAMs for available back-up cedures in case an emergency return is required. formation flight is planned, every flight member uld review emergency return and lost wingman cedures. A detailed study of the weather condi- s is perhaps the most important aspect of the flight preparations. The pilot must mentally pre- himself to anticipate the visual to instrument ngeover.

he actual performance of the ITO begins in the cks. A thorough instrument cockpit check might ent a surprise later. In multi-place aircraft, the performing the takeoff should brief applicable members to monitor appropriate performance ruments during the ITO. A review of aircraft flight ual procedures for takeoffs might be advisable. ITO is accomplished by reference to both visual instrument cues. In the initial stage, the takeoff lmost completely a visual maneuver. As visual rences deteriorate, more reference must be made ne cockpit instruments. The weather conditions ent will dictate how rapidly the changeover must r. The changeover will be readily apparent to pilot, for example, in low ceiling/low visibility litions (e.g., precipitation, fog, etc.) or high ng/low visibility situations (e.g., ground fog, ke, haze, etc.). The low ceiling/high visibility litions associated with the low stratus clouds, for example, may, however, catch the pilot off guard if he is not mentally prepared for them. Although the actual takeoff will be completely visual, the pilot must prepare himself for a sudden entry into complete instrument flight conditions shortly after getting airborne.

With proper planning, the takeoff itself should be easy. If your aircraft has a flight director system, setting the heading set marker to the runway heading will provide an easy to use display for maintaining runway heading and wings level attitude after airborne. It will not correct for wind drift, however. Therefore, if your takeoff clearance is to maintain runway heading, the intent is to maintain a ground track out the extended runway centerlne. To accomplish this, drift correction should be applied to correct for known winds. Another technique for maintaining centerline is to use a localizer course if available on the takeoff or opposite runway. This will provide a reference to the runway centerline provided the appropriate ILS front course is set in the course selector window. The Course Deviation Indicator/ Course Indicator will remain directional under these conditions but beware, as the bank steering bar may not be reliable in some flight director systems.

The ITO is not. in itself, a difficult maneuver. Without adequate preparation and forethought, however, it can lead to unexpected and sometimes disastrous results. The next time you contemplate flying an ITO, try applying some of the techniques that have been discussed here. If they are properly applied, you will probably find yourself safely airborne every time.

As mentioned in our last approach article, the USAFIFC is in the process of closing down. In case you missed reading the March "IFC Approach" article, it stated that the USAFIFC will be closing on 30 June 1978. Until that time, most of your instrument related questions can still be answered there. For TERPS call AUTOVON 487-4274. For pilot procedures/directives call AUTOVON 487-4276. For questions on FLIP call AUTOVON 487-4884. The responsibility for AFM 51-37, AFR 60-16 and AFP 60-19 has been relocated in a section at HQ ATC. Questions on these publications can be answered at AUTOVON 487-5835. ★

SHEAR DISTRESS

MAJOR JOHN E. RICHARDSON
Directorate of Aerospace Safety

"TANGO 21: *You are cleared for an ILS approach to Runway 30. Current Offutt weather —800 scattered, 3,000 broken, visibility 3 miles in light rain, moderate to heavy thunderstorms 10 miles north of field, winds 310 at 10. The last two aircraft on the approach reported turbulence and possible wind shear just prior to the middle marker."*

The aircraft starts down the ILS glide path. The pilot makes a slight correction and the pitch and bank steering bars on the ADI center. A glance at the airspeed shows it to be right on computed final approach speed. As the aircraft approaches decision height, the pilot notices that the airspeed is dropping off. At the same time, the pitch steering bar indicates that the aircraft is dropping below glide path. The pilot adds power and raises the nose as turbulence shakes the aircraft.

This pilot is faced with a fairly common problem. The question now is how to handle the situation. The more we study wind shear, the more we learn about the phenomenon and develop methods to combat its effects.

What is wind shear? Basically, it is a result of a change in direction and/or velocity of wind.

An aircraft is affected by this change because the aircraft motion relative to the ground is also changed by the wind. At altitude this is usually not a problem, except for the turbulence associated with a shear plane. There is usually enough altitude and airspeed to compensate for the changes. However, the situation may become critical in the traffic pattern or on takeoff. The safety margin could be too thin. It is possible for the wind shear to exceed the pilot's capabilities or performance of the aircraft.

We can discuss performance capabilities in terms of available energy. Changes in energy cause changes in aircraft position and speed. In unaccelerated flight an aircraft maintains a certain energy level, balanced against the surrounding atmosphere. If this balance is disturbed, by a wind shear, for example, some compensation must be made. Events in an aircraft are dynamic, and the aircrew is continually reacting to the changing flight conditions.

Changes in wind velocity or direction are part of these dynamic conditions. The crew perceives the need for a change in aircraft energy levels through the instruments and makes changes. The applied corrections are not, however, instantaneous, and as a result, the reactions of the crew or aircraft may not be sufficient.

HEAD WIND

Using the situation we had at the beginning of this article, let's trace three hypothetical wind shear encounters. These are cases where the shear is the result of a decrea[s] head wind. In such a case, the[r] a transient loss of airspeed and This causes the aircraft to desc[e] The pilot must compensate for loss of lift. The critical facto[r] that of sufficient altitude to c[o]plete the recovery. In Figure 1, shear occurs at an altitude [h]enough for the pilot to complete recovery (just past final appro[ach] fix, for example).

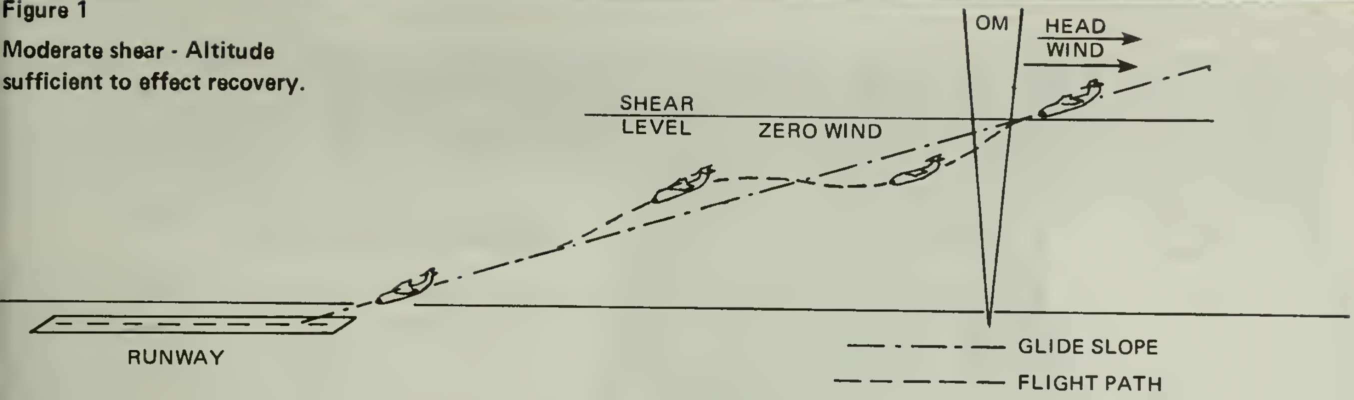
As the aircraft passes through shear level, airspeed and lift lost. The aircraft starts to sink drops below the glide path. The [pi]lot sees this as a deviation and [cor]rects with increased pitch and p[ow]er. Very often the correction is great and the aircraft oversh[oots] the desired airspeed and glide p[ath]. However, there is sufficient altit[ude] to correct and the aircraft la[nds] safety.

Let's consider a case where wind shear occurs farther down glide path. Reaction time beco[mes] more critical. Again, the initial action of the aircraft to the sh[ear] and the pilot's correction are same. However, if the pilot overc[or]rects and the aircraft goes above glide slope and airspeed increa[ses] there is insufficient altitude and time to correct, and the aircraft [may] land long and hot.

The third case is the most c[riti]cal. The wind shear is of suffic[ient] magnitude or the altitude of occ[ur]rence is too low to effect a recov[ery] and the aircraft lands short.

Figure 1

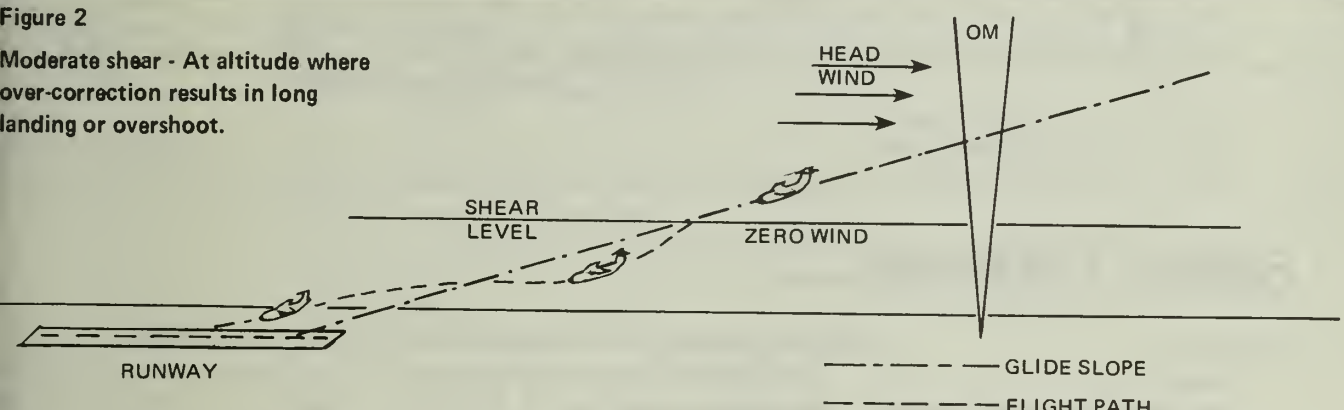
Moderate shear - Altitude sufficient to effect recovery.



- Loss of indicated air speed is equivalent to shear value.
- Lift is lost, aircraft pitches down, drops below glide slope.
- Pilot applies power to regain speed, pulls the nose up and climbs back to the glide slope.
- Probably overshoots the glide slope and target air speed but recovers and lands without difficulty.

Figure 2

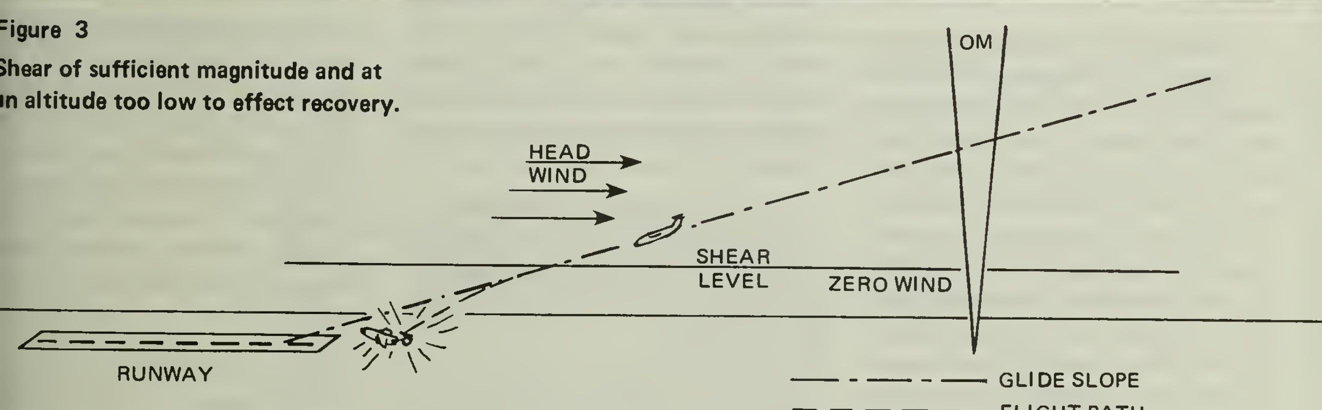
Moderate shear - At altitude where over-correction results in long landing or overshoot.



- Loss of indicated air speed is equivalent to shear value.
- Lift is lost, aircraft pitches down, drops below glide slope.
- Pilot applies the power to regain speed, pulls the nose up to climb back to the glide slope. Nose up trim may have been used.
- When airspeed is regained, thrust required is *less* than required for the previously existing head wind.
- Thrust is not reduced as quickly as required, nose-up trim compounds the problem, airplane is climbed back above glide slope.
- Airplane lands long and fast.

Figure 3

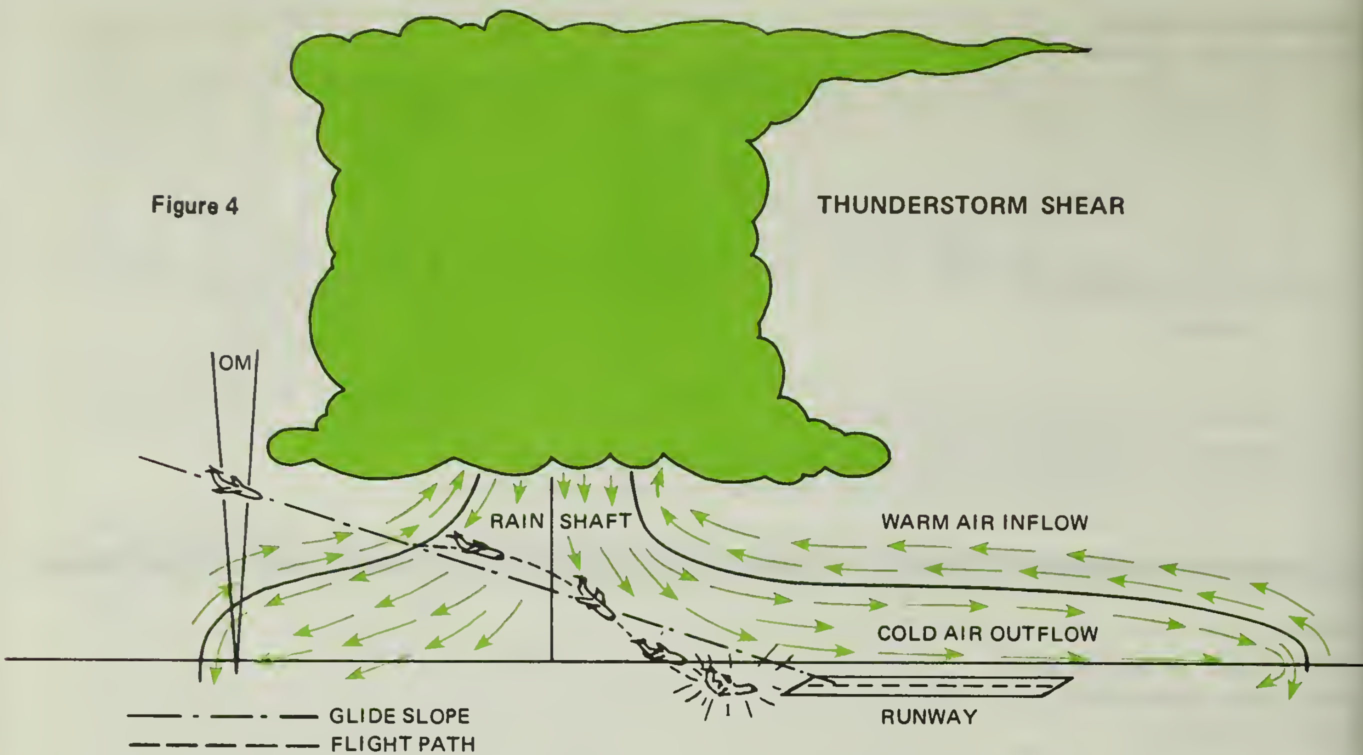
Shear of sufficient magnitude and at an altitude too low to effect recovery.



- Loss of air speed is equivalent to shear value.
- Lift is lost, aircraft pitches down, drops below glide slope.
- Pilot applies the power to regain air speed, pulls nose up to climb back to glide slope, engine spool-up requires time.
- Aircraft is in high drag configuration, altitude critical, increase in angle of attack produces only a slight or momentary increase in lift accompanied by a tremendous increase in drag as the maximum value of the lift/drag ratio is exceeded. The result is a momentary arrest of the descent with decreasing air speed followed by a large increase in an already high descent rate.
- Pilot's only hope is to pull on the yoke and push on the throttles.
- Pilot action is too late, aircraft crashes short of the runway.

Figure 4

THUNDERSTORM SHEAR



Shear Distress continued

TAIL WIND

A decreasing tail wind has the opposite effect. When the aircraft crosses the shear and loses the tail wind, lift increases and the aircraft climbs above glide path. As in the case of a head wind, the pilot's reaction can mean an overcorrection and transition to below glide path. Once again, recovery is dependent on altitude above the ground.

Wind shear is not the simple matter it was once thought to be. The asumptions that an airplane flying into a decreasing head wind will land short while one flying into a decreasing tail wind will land long are too simplistic. Other factors are involved. Regardless of the complexities of wind shear, there are a few actions which will prove helpful. The first requirement is an awareness. If you, the aircrew, are aware of the presence of wind shear, you will be better able to cope with it. Your reaction time will be reduced due to mental preparation. The pilot's perception of a deviation from glide path or airspeed is affected by knowledge of the shear. If the pilot is aware of the possibility of overcorrection, overshoots become a bit less likely.

Airspeed and power are two other factors. A few knots extra (the Dash One gust factor except in a tail wind) makes it a lot easier to control the aircraft. Changes in configuration (flaps, speed brakes, etc.), when available, can mean higher power settings and better response times to overcome surprises caused by shear.

If such options are available to you, a little pre-approach planning as to speed and configuration can pay high dividends when you suspect wind shear.

The most common reason for a wind shear encounter turning into a mishap is a pilot attempting to salvage a bad approach. Therefore, mentally be prepared to initiate a go-around if it doesn't look right.

THUNDERSTORMS

One other part of the subject wind shear which should conce pilots is thunderstorms. The effe of the severe winds in a thund storm are well documented. In least two cases, a military trainer one occasion and a civil jet another, the direct cause of a cra was wind shear associated with thunderstorm.

The best advice for flying in near thunderstorms is DON'T! T guidance in AFR 60-16 is very sp cific and definitely worth followin The capabilities of *any* aircraft c be exceeded by the "gust front" of moderate or severe thunderstor and the positions of such gusts a unpredictable because they move rapidly.

Wind shear is one of the "occ pational hazards" of flying. We ca not avoid it. At best, we can on hope to learn about wind shear a be prepared to cope with it whe it occurs. ★

OPS TOPICS

DO YOU SMELL BURNT TOAST?

A B-52 crew experienced a strange physiological incident. On climbout, the lower compartment crew members, while on normal oxygen, reported a burnt toast odor. The entire crew went on 100 percent oxygen, but as the climb continued, the fumes became stronger and some crew members reported dizziness, light-headedness, tingling hands and feet, and eye irritation. The pilot initiated an immediate descent and selected ram air on the air conditioning system. The fumes dissipated by 10,000 MSL. Post flight inspection revealed two bird nests lodged deep in the precooler heat exchanger. The nests blocked the flow of ram air, causing the precooler to overheat. Hot air also entered the catalytic filter, causing the filter element to overheat and to emit burnt toast smelling fumes. It is thought that the epoxy glue, used as a filter adhesive, when overheated may emit fumes which are irritating to the eyes. Beware of any strange odor. Select 100 percent oxygen and watch for hypoxia symptoms.

TO STALL OR NOT TO STALL

A short note for C-9 pilots. For those of you who missed the NTSB report on the November 1976 Texas International DC-9 crash at Stapleton International, it is summarized here:

As the DC-9 passed through rotation speed and at a point just prior to lifting off the runway, it received a stall warning which triggered two actions in the cockpit:

1. The pilot's control column began to shake.
2. The stall warning sound was emitted.

The pilot decided to abort the takeoff, but the jet overran the runway, struck several approach light stanchions, caught fire and burned, resulting in injury to 14 persons and substantial aircraft damage.

The board held that the decision to reject the takeoff, "Although not consistent with standard operating procedures and training, was reasonable in this instant case, based on the unusual circumstances . . . , the minimal time available for decision, and . . . a potentially catastrophic situation." The board further stated that the stall warning was due to a malfunction in the stall warning system.

COMMUNICATION

An F-111 was scheduled for a Fuze Test mission carrying munitions only on the external stations. A write-up in the AFTO 781-A stated "do not operate weapons bay doors in normal or auxiliary modes (operate manually only)." However, the before exterior inspection checklist says to check the weapons bay door control switch to ensure its position agrees with the position of the weapons bay door. The copilot, following this checklist, placed the weapons bay door control switch to closed and placed the auxiliary control switch to normal. Just after engine start, a loud pop was heard, and the crew chief observed hydraulic fluid streaming from the aft edge of the weapons bay. Investigation revealed both doors were overdriven to the closed position, and the aft lips on both left doors were cracked. Although the investigation is not yet complete, it is obvious that once again that old demon, communication breakdown, reared its ugly head. Somewhere in the travel of information from 781 (or Maintenance) to pilot to copilot and back to pilot, vital communication was lost. ★

The Automatic Complacency

A man-machine problem faces the pilot in his role as a programmer and supervisor in an environment that provides automatic systems to do the work but where the redundancy concept requires the pilot to be in a "continuous loop" function. How to cope with the problem is discussed in the following presentation at a Flight Safety Foundation seminar for pilots by Captain K. E. Ternhem of SAS:

In our role as pilots in an e
ronment that provides tech
ogy to do the work for us a
matically but not always int
gently, and without qualified
terface between the individual
tems, we have a problem. We
faced with a man-machine in
face problem we might call "a
matic complacency."

To combat the problem, it m
always be borne in mind that
machine, be it even the most c
plex computer, is but a tool,
signed to aid the man in perfo
ing certain specific tasks.
machine cannot think for us an
cannot work outside its rigidly
fined performance envelope.
cannot even be complacent. O

ently, there is every reason
he man not to let these tools
on their own and without
ing their weak spots and the
s of their capabilities.

r example, the autothrottle
he autopilot normally perform
specific assignments very
but neither system knows
of what the other is doing or
to do, and neither system
s much about operation limi-
ns (with some exceptions,
on the DC-10). Still we seem
an on the automatic systems
e automatic flight control sys-
in this particular respect—to
a degree that we may be-
lax in our attention to the
ary flight instruments or even
e our priorities.

E EXAMPLES
M REAL LIFE:

an automatic approach, a
on the glidepath at 500 ft
ed a very marked pitch down,
ting in excessive sink rate.
pilot, though fully aware of
ituation did not react until
ituation was so critical that
y low pullup had to be made.

nav mode enroute, the air-
turned the wrong way over
ckpoint. Although the wrong
ior was immediately noticed,
ircraft turned more than 45°
e the pilot took action.

route during INS operations,
rew did not notice that the
mode selector had been
ned to HDG. The aircraft pro-
d on a straight course for
minutes instead of turning
the waypoint.

an approach, the autothrot-
ecame inactive. The speed
ed 15 Kt. below correct
before the malfunction was
d.

e altitude preselect malfunc-
during descent. This went
iced by the pilots and an ex-
e undershoot was made.

leveloff by use of the altitude preselect, the throttles in idle, the speed dropped close to stall before detected and rectified by power application.

These examples, of which kind there are many, are not unnatural in a logical sense. They are fully explainable human-engineering wise but they should not occur unless there is a breakdown of the normal routine.

What is disturbing is that we tend to defend ourselves by blaming the system (which is only a contributing factor) and considering it legitimate to trust the technique and change our otherwise sacred instrument scanning routine.

Another way to describe the problem is that we tend to fall out of the "loop." We have a problem of complacency and we as individuals may not be aware of it. The problem is not the pilot but our understanding of the mechanism that creates the problem and also the lack of intelligent means to train the pilot into the concept of integration with a competing machine. We are, of course, also aware of the fact that our aircraft installations, though at the top of the state-of-the-art, may not always be optimized in their function to serve the man.

THE CURE:

Because we do not know all the factors that create the problem, we are not prepared to give a recipe that totally eliminates the problem.

We can all agree, however, on some sound and concrete rules that, if followed, will keep us virtually out of the problem. But first, there is a need to clarify what the machine, the black box in our case, is really supposed to do for the man. We apparently make a big mistake if we believe that the machine has entered our environment for the sake of our convenience only.

THESE ARE THE REALITIES:

1. The machine does not relieve the man of his responsibilities.
2. The machine does not reduce the workload of man as regards his expected achievement. BUT . . .
3. The machine increases the total capacity.
4. The added capacity serves—
   - to improve safety,
   - to balance the workload,
   - to improve accuracy,
   - to improve regularity,
   - to reduce costs.

In this world of realities, the pilot's managing role in the man-machine teamwork can be condensed into this sequence of actions: plan—program—confirm—monitor—correct-reject—if necessary.

And with these facts in mind, you may agree that when you leave it to the automatic systems:

- Don't change your piloting priorities.
- Be aware of the system limitations.
- Be highly suspicious.
- Make clear beforehand what the system is supposed to do.
- Check what it's doing.
- Don't hesitate to reject the aid of an inferior system.
- Don't accept a system performance that you yourself under the circumstances could do safer or better.
- Don't make the use of an automatic system an end in itself.

To express these rules in a short sentence: "BE SYNCHRONIZED WITH YOUR AUTOMATIC SYSTEMS" or still shorter—"BE IN THE LOOP." ★
—Air Canada **Grapevine.**

presents
Rocky and His Friends Comment on Taxi Mishaps
or
"How to Ding a Wingtip (or whatever) Without Really Trying!"

By
MAJOR JOHN D. WOODRUFF • Directorate of Aerospace Safety

BULLWINKLE ASKS WHY

I'm sure you all remember the subtle humor of "Rocky and His Friends," a popular TV cartoon series. We recently had the pleasure of having Rocky and his friends visit us here at the Air Force Inspection and Safety Center. We gave Rocky and his staff the full blown treatment on our historical mishap data. Rocky didn't have too many question to ask (being a flying squirrel and, like most pilots, slept through most of the briefing), but Bullwinkle, in all his intellectual splendor, asked us one important question. "Why do you have so many mishaps where pilots taxi into things?" Bullwinkle thought all our mishaps took place in the air or on impact with the ground.

You know, we didn't have very many good answers for him. We've consistently done the same dumb things over and over again. To make a point, Bullwinkle translated a few of our taxi mishaps into a "Fractured Fairy Tale" format for us. (Let's hope he doesn't use any of them on the next show with Rocky.)

FRACTURED FAIRY TALES

FATIGUE AND CONFUSION: A B-52 was taxiing to parking after a 17-hour crew day. The marshaller handed the aircraft off to another marshaller and changed duties to a wing walker. The left wing tip nicked a truck.

WHICH TRUCK? A B-52, while taxiing to takeoff, struck a parked truck. The gunner mon tored the wrong parked truck.

HEAD IN COCKPIT: An A- while taxiing as nr two in a three ship, answered a radio call from lead. As the pilot looked left and down into the cockpit to determin which radio he was transmitting o his right wing struck another A-7 parked on the end parking spot.

TAXI LINES: A C-130 pilot failed to maintain his position on the established taxi line while on taxi out to takeoff. A parked C-13 was struck.

FOREIGN MARSHALLERS: A C-130 was being taxied in a foreign country to takeoff. The

al" marshallers thought there adequate clearance. The right tip struck a tree.

NHEEDED WARNINGS: The 30 engineer warned the pilot he was too close to obstacles he left side. The copilot coned to run the checklist. The looked left, but continued xi. The left wing struck a pole.

O MARSHALLERS: A C-130 taxiing in a congested ramp at a sister service airdrome. und control assured the pilot 30s parked there all the time. marshallers were available, and aircraft commander failed to ane a scanner to assist in ing. The C-130 pressed on and k an A-4 with its wing tip.

IISJUDGED DISTANCE: A 41 was taxiing in on a night o airlift mission behind a ow-me" vehicle. During taxi-in, pilot observed a tow tug ying a feathered prop. He ght the aircraft was clear, but right wing collided with the r tip of the prop.

WING WALKERS: A C-141 with a wing walker and "follow-me" was given a left turn to position for parking. The copilot and scanner queried the wing walker about sufficient clearance. After receiving a signal to proceed, the aircraft moved forward and the wing tip struck a tree.

CLEARING THE AREA: During preflight, the aircrew of the F-4 observed that a power unit was located forward of the right wing and would have to be moved prior to taxiing. When taxiing signals were received, the aircraft moved 5 feet and hit the power unit.

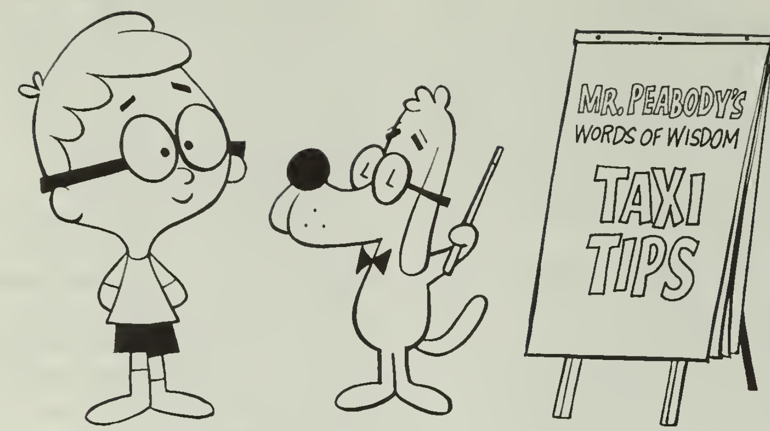
FORMATION TAXIING: Two F-4s were taxiing for takeoff. One aircraft pulled forward and attempted to pass in front of the nr two aircraft. The left wing tip brushed the radome of the second aircraft.

IF AT FIRST YOU DON'T SUCCEED: An F-4 was scrambling out of an alert shelter and as it passed the arch opening, the left wing tip contacted an electrical junction box. After the aircraft stopped, the launch crew inspected for damage, and gave the pilot the okay signal. As the aircraft began its taxi again, the pilot began a slight left turn and the left wing tip struck the (you guessed it) electrical junction box again.

DROPPED TOLD CARD: As the F-100 taxied out of the parking position, the takeoff and landing data card slipped off the pilots clipboard. While the pilot attempted to retrieve the card, the left wing tip struck a tug parked in the next taxi lane.

RADIO CALLS: As the F-102 taxied out of the alert hangar, ground control called the pilot. Nosewheel steering was momentarily lost when the pilot accidentally hit the nosewheel steering button on the stick in an attempt to acknowledge the transmission. The left wing tip contacted the hangar wall.

KNOWN HAZARDS: The condition of the ramp and taxiways had numerous hazards known to the pilot. While an O-2 was taxiing to takeoff, the front propeller



struck a section of PSP that was sticking up.

MULTIPLE DISCREPANCIES: Crowded parking area, unlighted rockpile, no wing walkers. The T-33 was being taxied to the parking area when the left wing tip tank fin struck an unlighted rockpile just off the edge of the ramp.

DISORIENTATION: While taxiing the T-39 to the taxiway from the parking ramp, the pilot became disoriented due to restricted visibility (darkness and blowing snow). The pilot turned short of the taxiway and the aircraft coasted to a stop off the ramp area.

MR. PEABODY OFFERS WORDS OF WISDOM

After the briefings, Mr. Peabody had a few words of wisdom to offer "his boy Sherman" on how to prevent some of our "Fractured Fairy Tales." We in the USAF might recognize them as "lessons learned." Mr. Peobody told Sherman:

• Keep your head out of the cockpit while taxiing in congested areas.

• Don't run checklists while taxiing if you don't have to.

• Stay on those taxi lines—they won't guarantee you clearance, but they will help.

• Don't place blind faith in marshallers, they make mistakes too—if it doesn't look right, stop and get it straight.

• Heed warnings given by other crew members, marshallers, wing walkers.

• Don't taxi into congested areas without marshallers or wing walkers.

• Use all the people you can muster to help you clear—that means other crew members as well as ground personnel.

• Check the area around your aircraft prior to starting engines for obstacles that need to be removed before taxiing.

• Tuck away hazards in your mind that might affect your taxi route and use that information.

• Remember, your judgment of distance and clearance can fool you.

• Don't let the radios distract you when taxiing in congested ar

• Wingman consideration ap to ground operations as well a air operations.

• Take into consideration th weather—it's a factor on the gro as well as in the air.

• Don't taxi too fast—you c take corrective action at 50 kn

DO YOU NEED A REVIEW?

Mr. Peabody made several g points to Sherman that we shou pay attention to. However, if yo want to really get into the "act, and I don't mean the starring r in one of our "Fractured Fairy Tales," then browse through A 60-11, "Aircraft Operation and Movement on the Ground or Water." This regulation addres a lot of things other than taxi p cedures, some of the more important ones being:

• General procedures for ru up of aircraft engines.

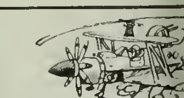
• Use of position lights.

• Use of radios.

• Requirements for personne engaged in towing operations.

• Aircraft marshalling signa Review your ground operations procedures—we don't want to you in the next presentation o fractured fairy tales! ★

Name That Plane



This aircraft intro duced thousands of WWII pilots to flying. Primary training was contracted to private schools, 64 of which were operating at wa end. Can you name For the answer, see Page 28.

NEWS FOR CREWS

formation and tips to help your career from the folks at Air Force Military Personnel Center, Randolph AFB, TX.

CAPTAIN ROBERT A. ZIENER
Rated Departmental/Joint Career Management Section
Air Force Military Personnel Center

Most Air Force officers realize fully that central selection boards are used in the temporary and permanent promotion process. However, y officers are not aware that in addition to pro-ons, MPC also uses central selection boards to tify officers for entry into several of the Air e's most popular (and expensive) training pro-ns. The use of central selection boards assures ble officers the opportunity to compete for valu- training programs. This article specifically ad-ses six training programs which are currently ned by central selection boards: Advanced PME, , ASTRA, Research Associates, Test Pilot School, Fighter Weapons School.

ich year the USAF Temporary Major and Lieu-nt Colonel Selection Boards nominate officers among the best qualified selectees for Inter-iate and Senior Service Schools. However, this nation does not guarantee PME attendance. October (for Intermediate Service School) and ary (for Senior Service School), MPC holds PME gnation Boards to determine which officers pre-ly nominated by promotion boards will actually d school that year. Smaller Supplemental Desig-n Boards are held each spring for both the In-ediate and the Senior Service Schools. In FY 78, officers were designated (627 for Intermediate and 247 for Senior PME) from among approxi-ly 2900 eligibles.

e USAF AFIT Selection Board meets each fall. all Supplemental Board is held each winter. The ds pick volunteers and centrally selected indi-ls for graduate education and education-with-try programs. Each year of AFIT training incurs ee year active duty service commitment (ADSC). cation is via letter to AFIT as outlined in AFM

e ASTRA Board meets each March to select officers for a one year training tour on the taff. To be eligible, you must have between and six years commissioned service, have com-l three years rated duty (if rated), and have leted Squadron Officers School. ASTRA incurs year ADSC following completion of the program. Application is via the AF Form 90 as outlined in AFR 36-20.

Research Associates is a program in which selected senior majors, lieutenant colonels, and colonels with advanced degrees spend one year in post-graduate studies in the fields of National Strategy, Policy, and Defense. The Research Associates Board meets each December. The FY 78 board considered 429 officers and nominated 62 to HQ USAF, Directorate of Concepts for selection of the final 12 individuals for entry to the program.

The Test Pilot and Flight Test Engineer Selection Boards meets once a year to select entries for classes starting each February and September. The next board will be held during May 1978 and will select entries for the FY 78B (Sep 78) and FY 79A (Feb 79) classes. A typical board would select 12 fixed wing pilots, 1 rotary wing pilot, 7 flight test engineers and 1 flight test navigator for each class. Application procedures are in AFR 53-19.

Entries to Fighter Weapons School are selected three times per year: January, May and September. Officers considered must be experienced fighter personnel nominated by their major command. Additional criteria can be found in AFM 50-5, Vol II. Each Fighter Weapons School Board selects 12 F-4 aircraft commanders and 7 weapon system operators from approximately 80 eligibles. As the F-15 and A-10 schools become fully developed, attendees will be selected in a similar fashion. Completion of Fighter Weapons School, which lasts 18 weeks, incurs a four year ADSC.

Effective education and training are extremely important elements of total readiness. But education and training are only effective when administered to the right people at the right time. USAF requirements dictate timing, while MPC is tasked with identifying the right people.

ABOUT THE AUTHOR

Captain Ziener is an ASTRA officer assigned as a Resource Manager in the Rated Departmental/Joint Career Management Section, AFMPC. His previous assignments have included flying T-29 and T-43 aircraft at Mather AFB, CA, and a tour as an IPIS instructor pilot at Randolph AFB, TX. ★

COMMON HUMAN BEHAVIORS & AVIATION

R. F. GABRIEL, Ph.D.

Human Factors Engineering

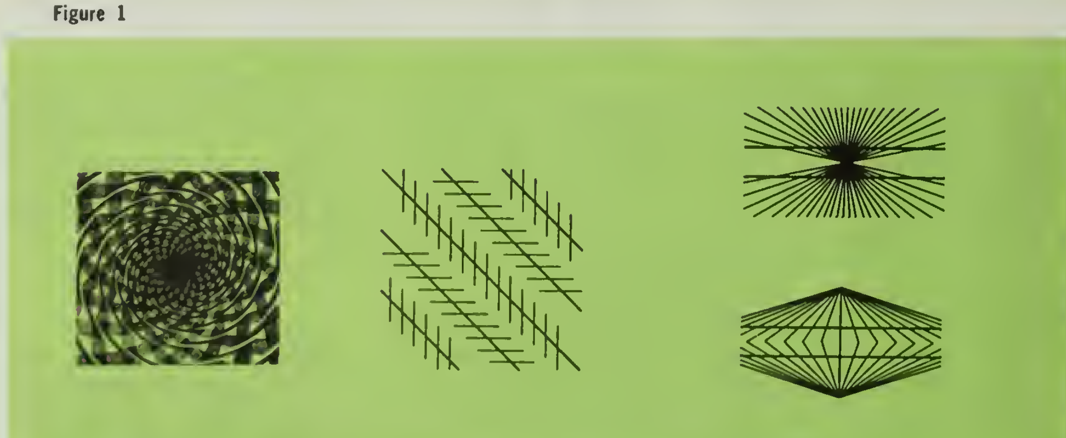
Douglas Aircraft Company

Look at Figure 1. Do you
ceive the lines in A as spi
. . . the long diagonal lin
B as unparalleled . . . horiz
lines in C and D also unparall
If you perceived them so, you
wrong. Trace the circular lin
A and you will find they are
centric circles. Measure betwee
diagonal lines in B, also betwee
horizontal lines in C and D,
you will find them paralleled.
preceding geometric illusions
monly affect all humans. The
vance of such illusions to avi
is uncertain, but it is probable
many aircraft accidents attribut
human error rose from other
versal psychological character
(common human behaviors).

Appropriate corrections can
only from understanding and
plication. This writeup, there
briefly presents some fundam
human behaviors and genera
backgrounds related to percep
attention, set, motivation, lear
memory, central information
cessing, and stress.

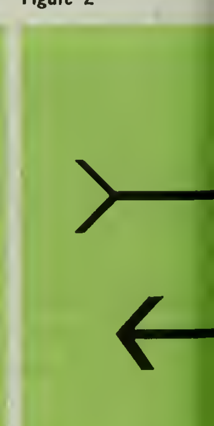
Approximately 80 percent o
real-world information is obt
visually. Under normal condi
perceptions obviously can be
accurate. But under illusory pe
tions, visual errors can lead t

Figure 1



Geometric Illusions

Figure 2



Muller-Lyer I

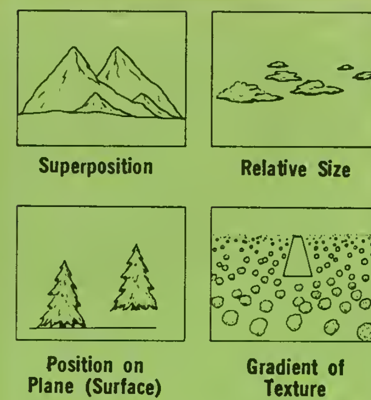
nate results. Despite extensive
es, no satisfactory explanation
sions has been discovered. Fig-
shows a well-known illusion.
ugh the top vertical line ap-
longer than the bottom, they
xactly the same length. Even
the lengths are measured with
r, the illusion persists. Another
n is demonstrated in Figure 3.
ch figure, the two horizontal
re the same length. Figure 3B
ates that the lack of realistic
is not responsible for the il-
.

e concrete example of an il-
in aviation involves the Pog-
rf Illusion (Figure 4). The
e lines cutting across the two
el lines are actually an exten-
of one straight line although
ppear separate. Figure 5 de-
wo converging aircraft on an
raffic Control display. An Air
c Controller observing this
might mistakenly conclude
ne two aircraft, if continuing
ir present course, would pass
when in fact they would col-
both were flying at the same
e.

times, pilots are forced to
between conflicting cues. If
incorrectly, illusions will oc-
ne "black hole" illusion is one of these. Simulator studies found that pilots seriously misjudged height on the approach when forced to make approaches using vision alone. The error depended upon how the airport was located with respect to city lights. An airfield with no lights in the foreground but with the city suronding it, such as might be experienced when approaching over an ocean or a lake, was especially hazardous. Sloping runways were another major source of illusory error.

One of the most interesting and important factors of human visual abilities is the judgment of depth perception. The perceptual cues of superposition, the relative size and height of the object in a plane, and texture gradient are illustrated in Figure 6. When some of these cues are lacking, or are inadequate, or in conflict, the ability to perceive distance may be seriously degraded and errors may result. An example of this is haze or fog interfering with vision. In very clear weather, hills appear near and dwarfed; in misty weather, they seem remote but loom large. Another depth cue is aerial perspective (dimming of an image as a function of distance). Reduction of brightness and color contrast also acts as a cue to distance.

Figure 6



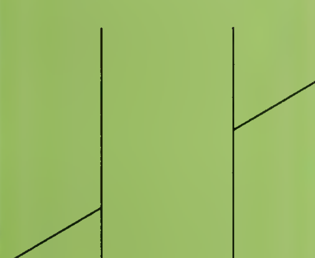
Monocular Cues to Depth Perception

Central nervous system effects can result from certain apparently harmless stimuli. For example, overexposure to flashing lights (strobe lights, anti-collision beacons, etc.) at certain frequencies and intensities can induce reactions ranging from drowsiness, nausea and disorientation to convulsions and trances. These effects are increased by the presence of fatigue.

Pilots visually judge glideslope, speed, and altitude with an adequate degree of accuracy. On occasion, however, the external visual environment is lacking in cues or offers cues that can be misleading

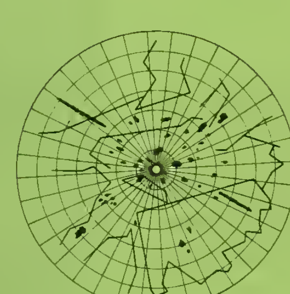
Pongo Illusion

Figure 4



Poggendorf Illusion

Figure 5



Concrete Example of Illusion in Aviation

cues because they differ from those most often experienced. Visual approaches and landings in the Arctic are notoriously difficult because snow covering the runway reduces the contrast between the runway and the surrounding terrain causing inaccuracy of depth perception. When a pilot has to land at an unfamiliar airport, perspective and size cues are assumed to be important cues to glideslope. All runways, however, do not have the same dimensions. A 12,000-foot-long, 200-foot-wide runway looks different than a 6000-foot-long, 100-foot-wide runway. Different spacing of runway lights can also cause speed judgment errors. Thus, while human perception may be quite accurate on an average, it needs consistent cues which are too often lacking in actual environment. Over confidence in one's ability to use visual judgments can lead to serious error. The pilot who heaves a sigh of relief once he breaks out of an overcast during an approach and relies totally on visual cues during the landing may be in for a rude surprise.

Focusing our perceptual abilities on one class of stimuli is called attention. Through our attentive processes we keep in focus selected stimuli and resist distracting stimuli. When two sets of stimuli are competing for our attention, the advantage generally falls to the ones of greatest size, intensity, most frequent repetition, and most vivid contour, contrast, or color. The specific need or interest of the individual can overcome all other factors.

Figure 7 illustrates that the brain can control the intensity of the stimulation reaching it and can actually tune out some stimuli. A cat was implanted with electrodes to measure the amount of neutral excitation going from the ear to high centers in the brain. Noises in the form of "clicks" were then introduced. When the cat was presented with mice inside a jar, its attention was devoted to them. "Clicks" introduced during this situation produced much less activity in the auditory centers of the brain.

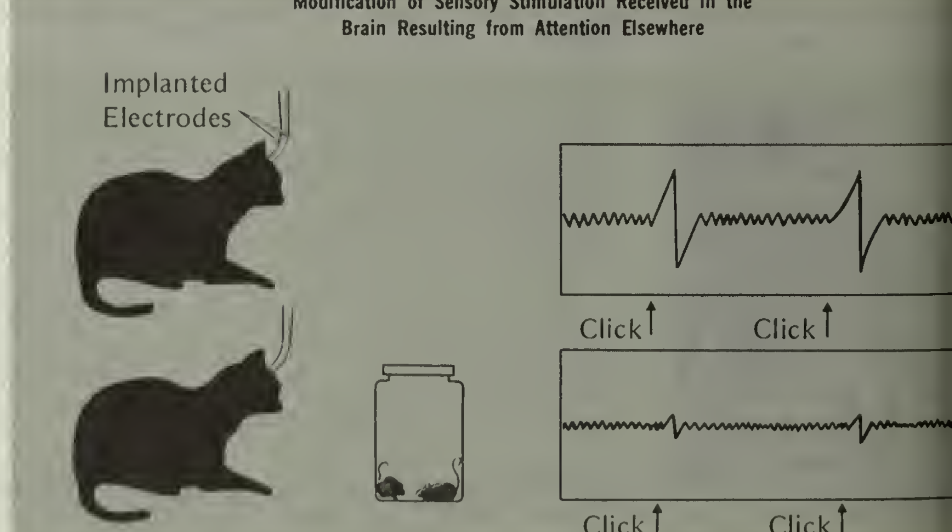
Man is able to focus his attention selectively. Psychologists presented different stimuli simultaneously to the ears of human subjects (dichotic listening). When subjects in one study were told to direct their tention to what was presented in ear, they remembered nothing what was presented to the other —not even gross shifts like ch ing from English to French tences.

A relevant example of selec attention in aviation is target cination (see Table 1). This situation in which the senses functioning accurately but the fails to respond to stimulation. types of this occurrence have identified. One involves the oper concentrating so hard on one as of his task that he fails to n other (perhaps more important) ments of the task. In the sec type, the operator perceives the formation but fails to act ap priately.

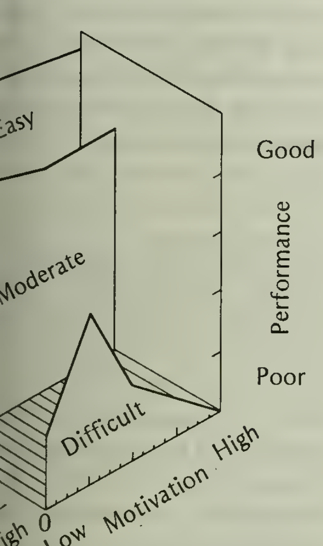
The concept of set is very portant and influences our beha in many ways. Set is the tend to use a particular method or of solution to a problem based u previous experience or directi The influence of set in avia might be as follows: Assume you making an approach into an u miliar island airport. You have

Figure 7

Modification of Sensory Stimulation Received in the Brain Resulting from Attention Elsewhere



t	TYPICAL TYPES OF ERROR OCCURRING AS A RESULT OF INNAPPROPRIATE ATTENTION, SET, OR MOTIVATION
tion	• Pilot so intent on tracking to flight director that he ignores sink rate, altimeter, airspeed, or raw ILS data. • In weapon delivery, pilot so intent on tracking target that he flies aircraft into target. • Pilot distracted by malfunction and forgets to maintain flight. • Pilot does not acknowledge or correct too high a sink rate or too low an altitude and undershoots.
	• Pilot expecting to be at 10,000 feet and misreads 1,000-foot altimeter indication as 10,000 feet. • Unintentionally continuing below minimums when inaccurate weather report received.
ation ict	• "Cutting corners" to maintain schedule. • Deviation from flight path to please passengers by providing view of geographic phenomena. • Consciously continuing below minimums. • Noise abatement approaches and takeoffs. • Making repeated attempts to land when weather deteriorating. • Reluctance of crew or the traffic controller to call to captain's attention an omission or error.



lustration of Yerke's-Dodson Law

runway lights in sight. Suddenly the lights are no longer in sight. Your set impression may be that you encountered a cloud. It can also be that you are too low and a mountain peak blocked your view of the lights, but you do not consider the latter possibility because clouds have often interfered with your visual perception while mountains have not. So, you wait for breakout and crash into the mountain.

Motivation is central to human behavior. It is a factor which arouses, directs and integrates all behavior. Optimum motivation for good performance depends upon the difficulty of the task. Figure 8 illustrates this law. In short, too much motivation may adversely influence performance when the task is difficult for the specific individual.

While some skills are innate (breathing, sneezing, etc.), most information-processing skills are learned. Man receives information from the environment through his senses; this information is processed and results finally in some type of behavior. For higher order mental processing, man has a fairly limited channel capacity. Have you ever looked up a phone number, got distracted and discovered you had to look up the number again because you had forgotten it? If so, you had experienced the limitations of a short-term memory (STM). This ability is important in most continuing tasks. While STM is limited to a capacity of 8 to 10 items, it is not greatly influenced by the type of information. Continuous attention and rehearsal are necessary for new information to be placed in the long-term memory store, but this rehearsal occupies the central information processor and limits the processing of other data.

If items could be recoded into larger conceptual units (called "chunks" to distinguish them from "bits"), memory capacity would be greatly increased. For example, many license plates use a combination of letters and numbers. Remembering LAC 059 is easier than 795-059 because "LAC" can be processed as one "chunk."

In contrast to modern digital computers, man's "computer" is very slow and the maximum processing rate for simple tasks is approximately two to three decisions per second. Simulator studies have found that the average time from engine failure to brake application in an aborted takeoff takes slightly longer. Of course, speed can be greatly increased when a particular situation is anticipated and highly practiced.

Although slow and often difficult to acquire, some skills can be lost quickly if not practiced. A recent study found that instrument flying skills were reduced approximately 20 percent after 4 months without practice. Procedures were most adversely affected. Skills of holding

Figure 9 Flow Diagram of Information Processing System

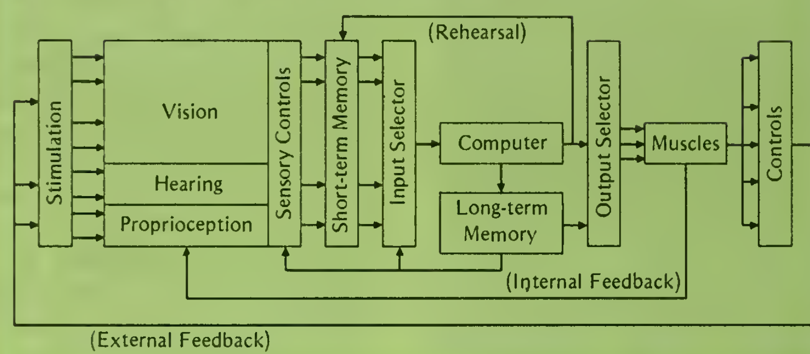
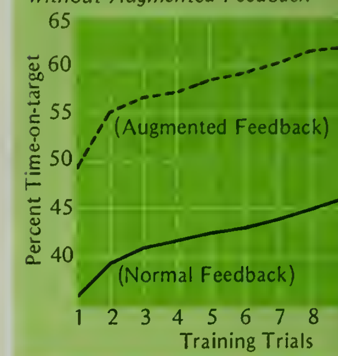


Figure 10.
Performance on Tracking Tasks Wi
Without Augmented Feedback



COMMON HUMAN BEHAVIORS & AVIATION continued

heading, altitude and speed suffered losses to a lesser degree. Time required to relearn the skills was directly related to the amount of original training. Something once learned or experienced is never lost from the long-term memory storage. Problems of long-term memory may be matters of retrieval rather than storage. Skills once learned are more quickly relearned even after long periods of disuse.

Very little learning takes place without feedback (knowledge of results). The essential information conveyed by feedback is the difference between intention and actual results. Feedback allows the individual to eliminate ineffective responses and to "fine tune" response patterns. In initial phases of learning, feedback is obtained primarily through the visual and auditory channels. The subject sees or is told the consequences of previous actions. As learning progresses, some of the feedback may be obtained through the sense receptors in muscles and joints (proprioception). An unskilled typist, for example, must look at the typewriter keys to hit the correct ones. Later, after a great deal of practice, stimuli from within takes over and finding the right keys becomes automatic. Feedback is not only essential to learning but also acts as a powerful motivator. (See Figures 9 and 10.)

Stress is the demand a work environment places on an individual and includes workload, boredom and other similar facts and conditions. Two types of overload are recognized. Speed stress occurs when the rate at which signals occur is excessive. Load stress results from having an excessive number of different information sources.

The effects of overload are dramatic; those of underload are not as immediately apparent. Underload can be as dangerous as overload. Literally hundreds of studies indicate that performance rapidly degrades on tasks such as monitoring sonar or radar displays (in which the sound or appearance of a target cannot be predicted and occurs infrequently). Degraded performance takes place within half an hour. To

Figure 11.
Functional Relationship Between Workload and Performance

reduce the effects of a boring
introduce artificial signals
feedback in the form of know
of results is provided; enrich
onmental stimulation by
aural noise when task is pri
visual; or add redundant obs
to increase the probability of
lus being detected. When wo
exceeds either the upper or
limits of the acceptable range
formance will suffer (Figure

It is hoped this brief dis
has apprised pilots of the undu
of relying solely on visual cue
ing critical phases of flight.
over, it is hoped operators will
further into common huma
haviors and select application
vant to aviation, then incor
such findings into special tr
or modification of existing
rules and procedures, causing
crease in human errors in the
pit.

* * *

(This writeup has been based
Douglas Paper 6401, "A R
of Some Universal Psychol
Characteristics Related to H
Error," by Richard F. G
Ph.D. — presented to INTE
TIONAL AIR TRANSPORT
SOCIATION 20TH ANN
MEETING at Istanbul, Tu
10-15 Nov 1975.) — Courtes
Flight Approach. ★

ATURE'S COMPASS

SSgt ALFREDO VARGAS
erations and Requirements Branch, 3636th Combat Crew Training Wing (ATC), Fairchild AFB, WA

ptain Salvo was drenched in erspiration as he pushed hrough the brush. He felt his should be near by, so he up the pace. It seemed that ter he went, the thicker the got. It was like reaching a t the end of a long tunnel e broke into the clearing. But nt slowly darkened as he rec- d the clearing as one he had o earlier in the day while try- get back to his camp.

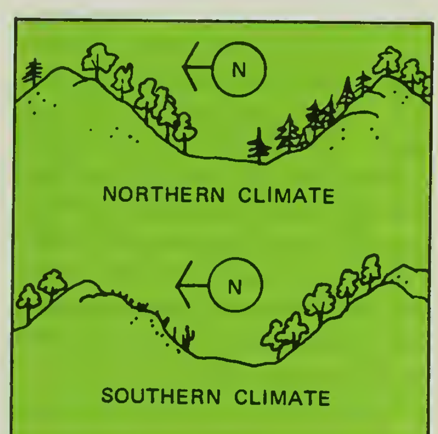
ing himself for having lost npass, he sank to his knees— ed and exhausted. He had andering for the better part day with no sense of direc- e had done well when he left early that morning by using to maintain an easterly di- but when "mother nature" ted the sun, she messed up igation, and his nice camp by kling stream became but a in his mind.

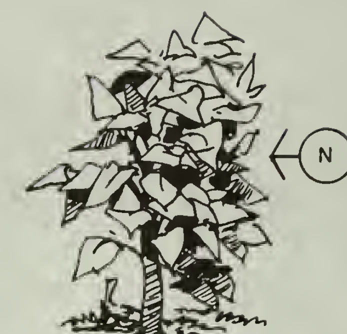
ner Captain Salvo nor any- e should have to go through ordeal, but it does happen ially during the nice months ear when we are all trying to er to nature. Getting disoriented and hopelessly lost have been frequent occurrences, at times with fatal results—as we often read in the newspapers. This should not be, because it can be avoided by gaining knowledge of plant life and certain insect characteristics which have come about due to the influence of the sun and wind. These factors can help you determine direction, thereby making your outing or survival episode more pleasant (if a survival situation can be labeled such) and assisting in your prompt and safe return.

VEGETATION

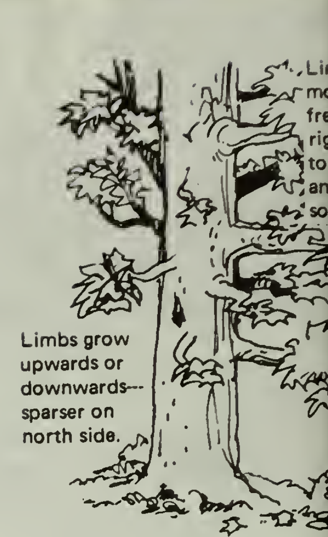
In order to determine direction using plant life, you must realize that the sun and wind are the primary causes for those distinguishing factors which are directionally oriented. In order to detect and use these signposts, you must become conscious of the type and natural shape of *vegetation in your area.* Initially, you must associate these signposts with the cardinal directions (north, south, east, and west) by using other sources of information (magnetized needle on a string, sun, stars, or compass).

The first factor to consider is the overall picture of the vegetation in your area. In cold and temperate climates in the northern hemisphere, conifers grow better on the northern slopes; leaf-shedding trees grow best on the south side, because of the warmer temperatures resulting from more exposure to the sun's rays. For example, the deciduous trees (cottonwoods and aspens) grow on the southern slopes while conifers grow on the northern slopes. Conversely, in the southern hemisphere, the vegetation which can tolerate hotter temperatures thrive on the northern slopes, while grasslands are more common on the southern slopes.





Plants will tend to be fuller on the side catching the most sun---usually on the south.



SURVIVAL: Nature's Compass continued

Wherever you are, in order to use vegetation as a guide, you must make yourself aware of the type and shape of vegetation that thrives there. Once you have this fixed in your mind (it can be done in a matter of minutes), determine whether there are recognizable patterns such as shape, size, and color, which are consistent and direction-related. Such patterns frequently are wind and sun caused. In any case, if you can recognize these same patterns as having consistent orientation, they will provide usable clues.

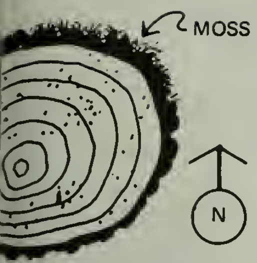
Wind damages the young shoots of plants on the windward side. They will be thinner and stunted, while those on the opposite side will be normal and flourishing. The wind, if persistent enough, will even bend trees, causing them to grow in that direction. Cone-shaped flower blooms and grass tassels will also grow in the direction of the prevailing wind. One exception, which is also a navigational aid, is the palm tree. Palms normally lean into the wind. The fronds (leaves) exhibit greater growth on the sheltered side, with the "head" flattened. The fact that you can determine wind direction by vegetation shape is important only if you know the direction of the prevailing wind for that area, in relation to north and south.

The effects of the sun on vegetation are also good aids in navigation, especially where the wind direction is variable. In most of the northern hemisphere, the arc of the sun (from rising to setting) is entirely on the south side of the sky. The midpoint of this arc is true south; in the southern hemisphere, it rep-

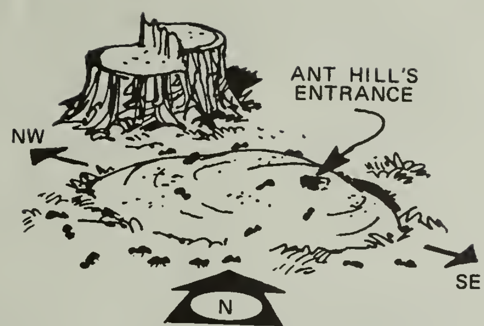
resents north. Abundant foliag be detected on the sunny si plants. In our hemisphere branches on the south side of will be almost horizontal, whi north-facing branches will be in number and grow at a mor tical angle. When using this i tor, it is best to use trees in areas which have not been dar by man or in some natural wa

Another way, not so readily able, to tell direction is by c down or notching a tree and ining its growth rings. Pick a tree if you can't find any lum area. In the northern hemis the growth rings will be clos gether and the bark will be t on the southwest side of tree the northeast side, the rings v farther apart and the bark th

Other plants are affected same way as trees and may b for navigational aids. Most have heard that moss grows north side of trees. Actually, generally grow on the nor northeast side. There are c factors you must consider using moss to determine dir Two important ones are hu and shade, with humidity bei dominating factor. Moss will where it is coolest and where ture is retained the longest



tree rings are thinner on the
t side. Moss will grow on the
side end cen be a grey-green
color.



Ants will orient their ant hill to catch the sun's rays----normally NW to SE with the opening on the SE end of the hill.

Spider webs will most often be found to be parallel to the prevailing winds.

et to know the characteristics ss' color and where it grows area in which you are operat- lost mosses take on a darker color when growing in great- ılight and are mostly sage (almost gray) when in more spots. Whether you use trees, , blooms, or moss, look for ognizable consistent patterns are widespread. Determine irection-related causes (pre- winds and sunlight) and use s clues to find your way.

TS

ain insect characteristics may ɛlp you determine direction. the cool areas of the north- misphere align their hills to both the earliest and the possible sunlight. They do orienting their oblong hills utheast by northwest direc- he entrance and the highest n the anthill will be at the st side, with the hill sloping the northwest. If they build est close to trees or stumps, ts will generally be on the st side. There is one excep- excessively hot areas, ants y try to shade themselves by nests on the northeast side . Ants and insects will react ight differences, depending eratures in your region.

prevailing winds can be de- d by observing spiderwebs because spiders cannot build webs against the wind. They take advantage of wind eddies and gusts to lay their strands from point to point, thus paralleling the prevailing wind. The principle is the same whether you are using the effects of the sun and wind on vegetation or on animals. These effects must be converted to signposts by associating them to the cardinal directions at the first opportunity.

Most people have a hard time maintaining a straight line of travel when distinguishing landmarks are unavailable as reference points. Moreover, they cannot even return to their point of origin if a conspicuous trail is not present. The areas mentioned above are designed to open your eyes to the fact that, with observation and awareness of your environment, you, too, can have the confidence of an old mountain man.

Some plents will face towards the sun whether the dey is cleer or cloudy.

A little stroll to reconnoiter the area for a possible signaling sight had turned into a nightmare for Captain Salvo and after awhile, still on his knees on the edge of the clearing, feeling helpless, he was wishing that he was a mountain man, with the ability to find his way in nature's garden. He could remember leaving camp early in the morning with the sun in his eyes and the stream on his left side. He could also remember that the stream was flowing in the same direction as he had traveled, and his dry mouth reminded him he had not crossed it. After some basic logic, he figured he had to go north to get to the stream. Great! But, where was north?

In a moment of stress, the mind is a wonderful thing—if you give it a chance. It came through for Captain Salvo, for he remembered a grade school experiment where pinto beans were placed on the windowsill to show how they grow toward the sun. With this in mind, Captain Salvo applied his sense of sight to his surroundings. It was not long before he figured out where south was and walked to the stream. He followed it upstream for awhile and came to familiar surroundings. Now, it was time to get on with the business of getting rescued. ★

Accelerated Copilot Enrichment

CAPTAIN JOHN H. WAYNE, JR. • 5 BMW Minot AFB ND

October of 1978 will mark three years of copilot participation in ACE programs across the country. What follows is an attempt by the author to assess the value of ACE and enumerate some of its strengths. The viewpoint expressed is based on the author's observations as a participant in the program.

Flying solo in T-37 and "team" (two copilots) in T-38 aircraft, SAC copilots are gaining valuable experience performing in roles as aircraft commanders. The ACE program presents the young copilot with unsurpassed opportunities to hone flying skills, strengthen judgment, and develop maturity through exposure to increased responsibility. The program adds another dimension to copilot duties and forms a strong foundation for future rigors as B-52/KC-135 aircraft commanders.

Prior UPT experience with T-37/T-38 aircraft enables copilots to qualify for local area solo or team sorties in a minimum amount of time. Copilot familiarity with these systems means comparatively little is invested in sunken costs before benefits of the program are realized. Upon completion of qualification and instrument check rides, copilots are soon free to fly unsupervised to practically any airfield in the CONUS.

Such freedom, however, carries with it a commensurate amount of responsibility. Herein lies the heart of the ACE program. The safe and successful completion of the mission becomes the responsibility of the individual copilot. Diminished supervision makes each sortie a decision making exercise from start to finish. Copilots become less complacent and soon develop a vigilant attitude towards flying safety. Each sortie adds a sense of personal accomplishment anc confidence in flying ability. ' result is a more mature and r sponsible SAC copilot.

Strange field approaches, in high density air traffic are present new demands on a co flying judgment. They requir greater attention to detail in planning and strong air disci during enroute and arrival pl flight. Responsibility for the does not end with engine shu Copilots must ensure that tra alert crews perform proper se and coordinate any necessary tenance, a capability which r may not be available. Decisio a "go-no go" nature must oft made when continuing the mi is affected by degraded equip If remaining over a period o days, weather developments necessitate an earlier departu than planned. Copilots often scheduling constraints and ca

l to allow weather to ground rcraft on the day of return. ces normally available for on planning, such as an on- weather shop, may be unavail- nd must be obtained through means. Much of this type of ure is totally new and some- intimidating. We all make kes and sometimes swallow a pride but become much wiser aving experienced error.

E provides a relaxed but pro- nal environment where co- can still "hangar fly" with ctors who readily impart their ledge and wisdom. As part of and subsequent check rides, ts are orally tested in ground ations reminiscent of those ienced in UPT. Questions relate to aircraft systems and able flying directives. As a , copilots enhance their pro- al knowledge. Other questions, however, are less direct and answers are not found in black and white. The "what if" situations presented, by design, are strictly judgment calls. The copilot is tasked to rely on his own knowledge and experiences to respond with a plausible course of action utilizing every remaining capability that the aircraft and situation present.

In a comparative sense, ACE is a cost effective program. T-37/T-38 aircraft use much less fuel and have lower operating costs per flying hour than either the B-52 or KC-135. And though flight characteristics of these aircraft may differ, the instrument approaches flown and environment in which all aircraft operate do not. Similar instrumentation between cockpits enhances flying proficiency and facilitates transition from one aircraft to the next. A larger amount of similar training can be accomplished at much less expense.

Participation in the ACE program is, however, subject to primary duty schedule constraints. Squadron copilot duties entail manning alert sorties, training flights, presentation of EWO and ORI briefings, and numerous hours of mission planning and ground training classroom instruction. Continuous ground testing and in-flight evaluation are a way of life. Much off duty time is devoted to personal study in order to meet standards in these areas. Family considerations also play a large part in determining availability.

In terms of cost and benefits derived, expenditures for ACE are an investment in the future. Copilots upgrading to aircraft commander in primary assigned aircraft will be better qualified as a result of their experiences in this program. ★

Mail & Miscellaneous

Send your ideas, comments, and questions t
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Norton, AFB, CA 92409

FLY SMART

As I finished writing a young pilot friend of mine, I signed off with "Fly Safe." But, as I looked at it, I thought to myself "Damn, he is really going to think I'm a jerk." So, I scratched out the "Safe" and changed it to "Fly Smart."

Some of our young troops aren't getting the flying time necessary to keep up with the pace of modernization of aircraft and tactics. They sometimes push themselves beyond their capabilities and get bit.

Maybe I have a misconception of how the young guys think, but I feel they have a lot of pride that sometimes gets in the way of judgment. Some even take offense to the safety initiatives and their message goes unheeded or, worse still, causes a reverse reaction with catastrophic results.

Perhaps if we change the approach to "Smart" it might ease off on their pride yet still achieve the desired effect.

Just a suggestion. Maybe it will help.

Capt Sandy Sharpe
HQ TAC/XPF
Langley AFB VA

BASE, GEAR CHECK . . . BEEP, BEEP, BEEP

The enclosed article (Ops Topic, Base, Gear Check . . . Beep, Beep, Beep," Page 16, January 1978) cannot go without comment. The O-2 pilot was not the first, nor will he be the last, to be caught in the old "switched-off-and-forgot-to-turn-on-Guard trick." How long are we going to continue to hammer the jock, who is only doing his best to cope with a situation beyond his control, while the real culprits are those who cause him to turn off Guard in the first place? I am aware of one command's regulation which requires its ground stations to announce to the world on Guard the dawn of a new Zulu day. It could have been such an inappropriate Guard transmission that caused our unfortunate O-2 pilot to turn off Guard. Ask a pilot when he last heard a bona fide emergency on Guard and he may not remember. Ask him when he last turned off Guard because of a non-emergency transmission and I'll lay you odds he'll say it was on his last flight.

I have two suggestions for consideration. First, the IG, noted for looking for the root causes of problems, could generate a Special Interest Item on the unauthorized use of emergency frequencies. Second and less formal, the jocks of the world could rise up with pen in hand and generate an AF Form 457, USAF Hazard Report, each time they heard an unauthorized Guard transmission. Either should straighten out the problem eventually.

Your article cited the communication breakdown, caused by not monitoring Guard, as one link in the chain leading to the accident. Let's throw a nickel on the grass to help buy the axe that breaks this particular link.

Lt Col R. J. Vanden-Heuvel
111 B Birch Circle
Eglin AFB FL

WHAT'S A DRAGON LADY?

Looking for a unique assignment? The only squadron in the world flying the Lockheed U-2 is the 99th Strategic Reconnaissance Squadron, at Beale AFB, CA. The 99th is presently in need of experienced pilots who enjoy flying alone and can thir themselves. The U-2 is a relatively u plicated aircraft and is, therefore, "f rather than simply programmed and tored. **You** carry the responsibility and make the decisions.

Being extremely cost effective, thi craft is continually tasked against a variety of missions, including photo atmosphere research and systems de ment. Operational missions are flown Beale and operating locations aroun world.

You'll find flying the U-2 is a dema job. The long recon sorties are flown pressure suit and at maximum perform It's not just a set-it-and-forget-it ai Even landing the "U-Bird" challenge most experienced pilots.

Still interested? If you have 18 m as a pilot in command and 1500 hour ing time (or, 1350 hours total with as FP/IP), contact the U-2 Manning Se of the 99th SRS, 9th SRW, Beale AFB, fornia, or call AUTOVON 368-2156/29

NAME THAT PLANE ANSWER

The Ryan PT-22 was powered by a 5 cylinder radial engine. Some of these aircraft can still be seen at airports in the US.

NEW SLIDE/TAPE PRESENTATIONS

1. "Lessons Learned — Midair Collisi (TS 749) (Length 15 minutes). Air s has become increasingly congested. program helps pilots develop good cle habits and helps them to understand need to see and avoid other aircraft. based on midair collision prevention niques. Order through your servicing film library.

2. "Lessons Learned — The Supervi Role" (TS 753), Length 15 minutes. dent investigators find supervisory la as underlying causes of aircrew factor dents. This program helps audience gai appreciation of the role supervisors in the prevention of accidents. O through your servicing base film library.

☆U.S. GOVERNMENT PRINTING OFFICE 1978 789/85

ATES AIR FORCE

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ent Prevention
Program.

1Lt Vaughn P. Belliston

466th Tactical Fighter Squadron (AFRES)
Hill Air Force Base, Utah

Lieutenant Belliston was on an instrument low approach in an F-105B aircraft. About 200 feet AGL, as he raised the gear handle on go-around, Lieutenant Belliston heard and felt a thump, and the cockpit immediately filled with dense, white smoke. The fumes burned his eyes, and he could not see the instrument panel. By putting his helmet against the side of the canopy, he was able to see the ground directly below. He established what he thought was a climbing attitude, checked oxygen at 100 percent, and went to "ram" with the pressurization lever. By leaning forward, he could see that the gear lights read unsafe. Lieutenant Belliston suspected a hot air line fire, and since the utility hydraulic system had apparently failed, he turned the main air line switch off. This stopped the utility hydraulic pump and AC generator. Then lead joined up, told Lieutenant Belliston he was descending slightly, that the gear was down, and that no evidence of fire was visible. As the smoke and fumes gradually dissipated, Lieutenant Belliston decided not to restart the hot air line and used emergency gear extension to get safe gear down indications. He followed loss of utility hydraulics and AC generator procedures and landed, using emergency brakes to stop on the runway. The source of the smoke was hydraulic fluid from a split line in the right main landing gear area. The fluid was vaporized when it went through an auxiliary air inlet into the engine compressor, main air line and, finally, into the air conditioner. Lieutenant Belliston's timely and decisive actions during a critical phase of flight possibly prevented loss of life and resulted in the recovery of a valuable, undamaged aircraft. WELL DONE! ★

SAFETY TROPHIES

FOR DISTINGUISHED CONTRIBUTIONS DURING 1977

Secretary of the Air Force SAFETY TROPHY

Category I

MILITARY AIRLIFT COMMAND (MAC)

The Category I award is presented to the USAF major command that has accounted for more than 2% of the total USAF flying time and has demonstrated the best overall safety program. The Military Airlift Command compiled over 750,000 flying hours yet had a mishap rate of only 0.8 per 100,000 hours, lowest of any major flying command and a 40% reduction over the 1976 rate. The nuclear weapons safety program was rated outstanding by the Directorate of Nuclear Safety, and MAC's motor vehicle accident rate was lower than the Air Force average. MAC's safety program displayed strong command support and heavy supervisory involvement in all aspects of accident prevention.

Category II

ALASKAN AIR COMMAND (AA

This Category II award is offered to a USAF major command that has accounted for less than 2% of the total USAF flying time and has demonstrated the best overall accident prevention program. The Alaskan Air Command stood out among other competitors by effecting impressive improvements in flight, ground and weapons safety. For the third consecutive year, AAC was able to boast zero Class A mishaps while completing over 16,000 flying hours in high performance aircraft. The explosive mishap rate was cut by two-thirds from the 1976 rate, and AAC did not have a military or civilian off duty private motor vehicle fatality. These safety accomplishments highlight Alaskan Air Command as an innovator in mishap prevention.

MAJOR GENERAL *Benjamin D. Foulois* MEMORIAL AWAR

AIR FORCE RESERVE (AFRES)

This award, sponsored by the Order of Daedalians, is presented annually to the command havin the most effective aircraft mishap prevention program. Major commands, the Air National Guard an the Air Force Reserve are all eligible. AFRES, the 1977 winner, was judged to conduct the most effe tive and consistent program toward the goal of minimizing flight mishaps. Flying over 140,000 hou in nine different aircraft types, AFRES experienced only two Class A mishaps without any mishap fata ties. The actual cost of all mishaps was $4 million lower than that incurred in 1976. The command com piled this impressive safety record despite aging aircraft, global missions, and minimum safety mannin at all echelons. The award presentation is scheduled for 3 June 1978, in San Antonio, Texas.

aerospace

SAFETY MAY 1978

IN THIS ISSUE

LIGHTNING AND AIRCRAFT

Some Electrifying Words On Lightning, Aircraft And You

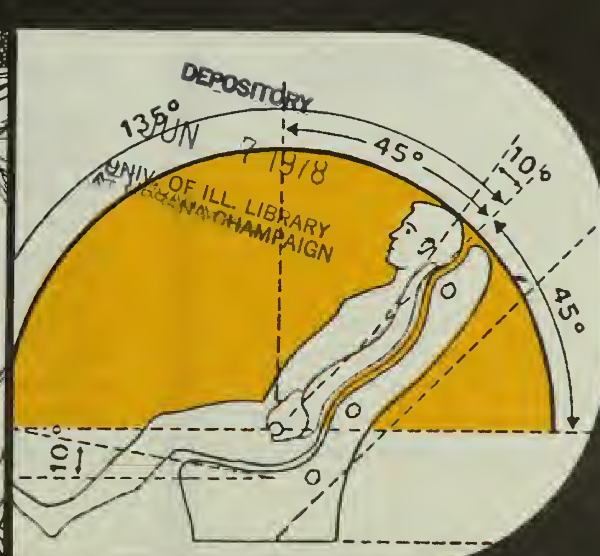
When You Gotta Go . . . Go!

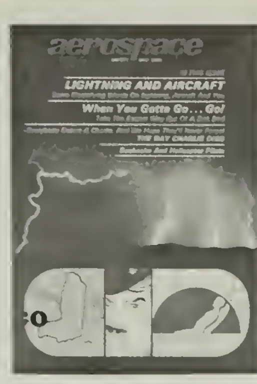
Take The Easiest Way Out Of A Sick Bird

erybody Knows A Charlie, And We Hope They'll Never Forget

THE DAY CHARLIE DIED

Backache And Helicopter Pilots





UNITED STATES AIR FORCE

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THE MISSION - - - - - - SAFELY!

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, US

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MAY 1978 AFRP 127-2 VOLUME ~~X~~ 34 NUMBER

HE AIR ILITARY JETS

eneral Aviation News
DOT/FAA

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The result has been a mix of civilian and military traffic which has some undesirable aspects. Camouflage paint, used by many military aircraft to avoid detection, makes it difficult for civilian pilots to see them in time. At the same time, high closure speeds, and intense workloads on the military pilots, reduce their ability to see and avoid other aircraft. FAA's Accident Investigation Staff has recorded an average of about 100 military-civilian near midair collisions per year, as well as some fatal collisions. To improve this situation FAA has concluded a new agreement with DOD which authorizes military aircraft to operate in excess of 250 knots below 10,000 feet MSL under following circumstances only:

1. Within restricted areas and military operations areas (MOA).

2. Within a large scale exercise or short term mission which the nonparticipating flying public is made aware of.

3. Along new IFR-only routes to be developed by DOD.

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5. The responsible military scheduling unit will inform a key or "tie-in" flight service station, on a daily basis, of all military training flights scheduled for the airspace below 10.000 feet in their area, with

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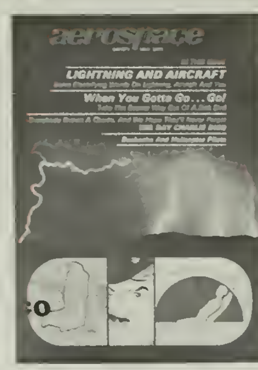

MAY 1978

UNITED STATES AIR FORCE

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THE MISSION - - - - - - SAFELY!

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SHARING THE AIR WITH MILITARY JETS

Courtesy General Aviation News DOT/FAA

ivilian pilots (*as well as military crews*)* will be afforded greater protection in 1978 an undesirable mixture of c with military aircraft, thanks new agreement that has re- y been worked out between and the Department of De- .

e general aviation fleet is ex- d to number 195,000 aircraft 981. Most of these aircraft op- below 10,000 feet MSL, where airspeed limit is 250 knots. ever, altitudes below 10,000 are also required by the mili- air services for certain essen- raining operations which must onducted at speeds in excess 0 knots, and this presents a em.

be proficient, the military ser- must train in a wide range borne tactics at altitudes fre- ed by general aviation aircraft VFR. The required maneu- nd high speeds of the military s are such that they may oc- ually make the see-and-avoid t of VFR flight more difficult ut increased vigilance in areas ning such operations. Aircraft ept, air-to-air combat, ground support, low altitude activi- nd photo reconnaissance are of the procedures that must be rsed in this segment of the ce to a point of complete ness.

ditionally, the full range of military flight training, from student preparation to professional airman status, must be carried out. To some extent this is accomplished within restricted or designated airspace, clearly identified on sectional charts. However, certain types of training missions must be carried out on flights which extend well beyond the range of restricted areas.

To accommodate the national defense requirements, FAA issued a waiver in 1967 to the Department of Defense which allowed DOD to authorize various training activities below 10,000 feet MSL at speeds in excess of 250 knots. DOD at that time developed two types of training routes:

1. TR routes. Used for VFR operations only, 1,500 feet AGL and below. Some 273 of these routes are current. They have been published only on the military DOD FLIP AP 1B chart, which has become known as the "Green Demon" chart.

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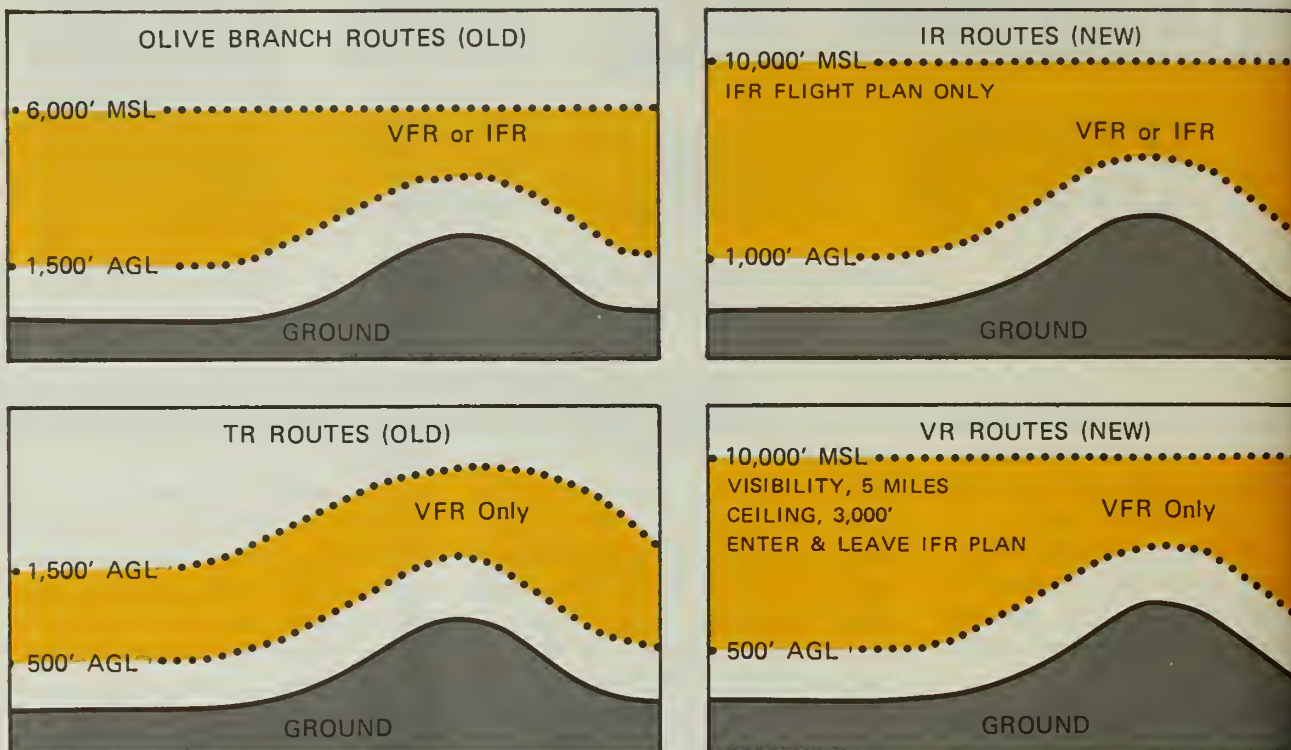


The old "Olive Branch" (upper left) and TR (lower left) military training routes at low altitude operate within the airspace designated on the dra The new routes, known as IR's (upper right) and VR's (lower right) will penetrate various altitudes below 10,000 feet MSL with varying widths. Mi FLIP charts show new and old routes; sectionals will eventually show new routes.

particulars as to time of activity, type of mission, etc. So far as possible, all training will take place along published routes only. The key FSS will relay information to all other stations within 200 miles of the "hot" route segments.

Note: The new program went into effect as of January 1, 1978, but DOD has until May 18 of this year to accomplish full compliance.

The new military training route system, known as MTR, incorporates several significant changes in the route structure:

- MTR routes may utilize any portion of the airspace at 10,000 feet MSL and below, but the total number of routes will be reduced to the absolute minimum required for mission requirements.
- All of the "Olive Branch" routes will be phased into the MTR program during 1978, and replaced either by the new IR routes, or when necessary by a new structure of VFR routes (called VRs).
- During this transition period of 1978 both the old VFR routes (TRs) and the new VRs will be in existence. Note carefully: All military training routes will be shown on the FLIP charts, but only the newly established routes, both VRs and IRs, will appear on FAA/NOS charts — as these routes are established, as the appropriate means of depicting them is determined, and as the charts become due for re-issuance.

Unlike the old training routes, the new IR and VR routes will be made up of segments which vary in width and altitude according to their mission requirements. For example, a lengthy straight line approach segment may be only two or three miles wide, while a shorter segment containing a target may be 15 miles wide. Similarly, a route may use only the airspace betw 1,000 and 1,500 feet along proach segments, but contain a get segment reaching up as higl 10,000 feet. This is intended to duce the amount of airspace which an undesirable mix of civi and military traffic may occur.

Three basic types of missi will be flown along the new M system: Photo Reconnaissance (Road Reconnaissance (RC), Strategic Navigation (SN). The vilian pilot flying in the area of tive routes may be interested in nature of the mission, but r importantly he will want to k the altitude and width of the r segments in his vicinity, and "hot" times.

All of this information will available at the FSS, where the vilian pilot may study FLIP ch sectionals, AIM, etc., and rec an update briefing (on request) pertinent low altitude military tivity. An MTR activity up

NEVADA/OREGON

WILDER OB-1

EFF:1100Z, 6 OCT 1977

*Hours of Operation – May be 24 hours daily, 7 days per week.

Olive Branch routes are all weather low altitude areas where the USAF and Navy conduct navigation/bombing training flights, both VFR and IFR. Pilots should know locations, altitudes and times of use for transiting these areas.

lso be passed along to pilots ponse to specific inflight quer- owever, the FSS will not rou- provide this information to who call in, unless it is spe- ly requested. For maximum , any pilot who does not have ve information to the contrary d consider all military routes his flight path to be active.

ppose, for example, a pilot in calls Washington FSS and

nis is Bonanza 24688 Juliet. g Richmond for Frederick, by of Fredericksburg and Manas- any military activity along my ?"

e FSS reply will read some- like this:

oger, Bonanza 2468 Juliet, on India Romeo eight zero hot fifteen thirty to sixteen ed zulu, mission Sierra No- er. Also caution Victor Ro- ight two zero hot fifteen forty- o sixteen thirty zulu, mission Romeo Charlie, Richmond altimeter three zero zero two."

The informed pilot will understand from this message that a Strategic Navigation mission will be flown on IR route 805 between 1530 and 1600 hours zulu, and that a Road Reconnaissance mission may be expected along VR route 820 between 1545 and 1630 hours. Locating the training routes on his chart, he will learn that IR 805 segment confronting his flight path includes the airspace between 4,000 and 6,000 feet MSL, and that the nearby segment of VR 820 extends from 500 to 1,500 feet above the ground. The pilot may also note from the chart depiction that both of these routes are relatively narrow, only about three miles in width, in the segments of his concern. For this reason he can be fairly certain that the military planes using these routes will not be maneuvering acrobatically, if he should decide to fly through the route. On the other hand, if he wishes to be especially careful, he knows that choosing any altitude between 1,500 feet AGL and 4,000 feet MSL will keep him clear of military traffic along either route.

This same information may be heard on the live weather scheduled at 15 minutes past the hour on the VOR transcribed weather broadcast or on PATWAS (Pilot Automatic Telephone Weather Answering Service) where available. Information regarding a particular route will also be broadcast 30 minutes prior to and during any activity on the route.

During the 1978 transitional year of MTR, civilian pilots are urged by the FAA to use all necessary sources of information to make certain they are correctly informed about military training flights in their area. Since the total amount of airspace given over to the low altitude training will be reduced in the new system, traffic along published routes is expected to increase. Incidentally, FLIP charts are available for study at most airports in public use. The DOD sends out 13,000 free copies annually to fixed base operators and airport managers.

The first FLIP charts containing new MTR routes were published on December 29, 1977. Publication of military routes in FAA civilian charts will be undertaken during the course of 1978, and pilots will be notified of their availability through *General Aviation News* and other publications.

Sharing the airspace intelligently is a matter of self-preservation. The sky above us will remain free only as long as we are willing to bear the burden of defending it.

NOTE: A free advisory circular. AC 210-5 contains further information on military flying activities. For a copy write to DOT, Publications Section, TAD 443.1, Washington, DC 20590. ★

When you gotta go—GO

RUDOLPH C. DELGADO
Directorate of Aerospace Safety

Year	Ejections	Survived Number	Survived Percent
1976	64	50	78
1977	70	54	77
1978-1	17	13	76

Fig. 1

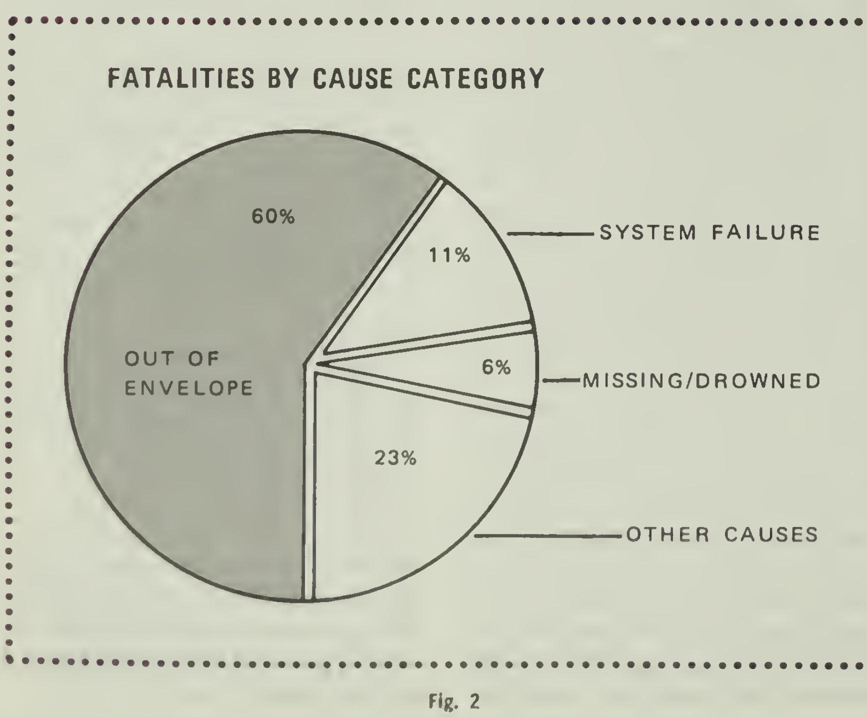


Fig. 2

The USAF ejection survival a subject that should be ne and dear to the hearts of crewmen who fly ejection-seat-equipped aircraft has been un-comfortably low lately.

In previous years this rate ha hovered around 82 percent, but as shown in Figure 1, in 1976 went down to 78 percent, and i 1977 it dropped to 77 percent. undesirable trend continued th the first quarter of calendar yea 1978, with a 76-percent rate.

Historically, out-of-envelope tions have accounted for over h of the total ejection fatalities. T remaining fatality causes are u divided between material failur missing/drowned, and "other." ure 2 shows a breakdown of the based on a 10-year period of tion experience. The material f and missing/drowned categorie are already being addressed b responsible agencies. The "othe category is a catchall for the ra problems which, individually, d occur in sufficient numbers to w full-scale modifications.

ed on the foregoing, then, it rs that the out-of-envelope ory is the one that offers the st potential for improvement. far easier said than done. , this problem is the most diffi- ne in the emergency escape os attested to by the fact that plagued us since we started ejection seats, and we have unable to satisfactorily con- to date.

ew years back a big effort ade to improve and modernize g escape systems to enlarge scape envelopes. After this one, no appreciable improve- n the overall ejection survival as noted.

ly the emphasis has been on ed aircrew life support train- an effort to increase aircrew ness of their escape system's ilities and its safe escape pe. This is a step in the right on. But the real key to the thing is the individual crew- t starts and ends with him. to want this knowledge about ope system, and then he also be prepared to use it without ion to save his life when the t is no longer flyable. It not matter whether it be be- it is breaking up or is out of .

ody claims that this is an ecision to make, and it cer- isn't. It becomes even more t when the crewman knows be his fault his aircraft is ble. Figure 3 shows very tically that operator factor s have a very high percen- f out-of-envelope ejection fa- , whereas logistic factor s have a comparitively low r. The point here is that the ho finds himself in trouble due wn mistake will usually try rcome his problem longer than ose problem is not of his oking. In far too many cases

ACES II ejection seat, a high technology system, will be used in F-15, F-16 and A-10 aircraft.

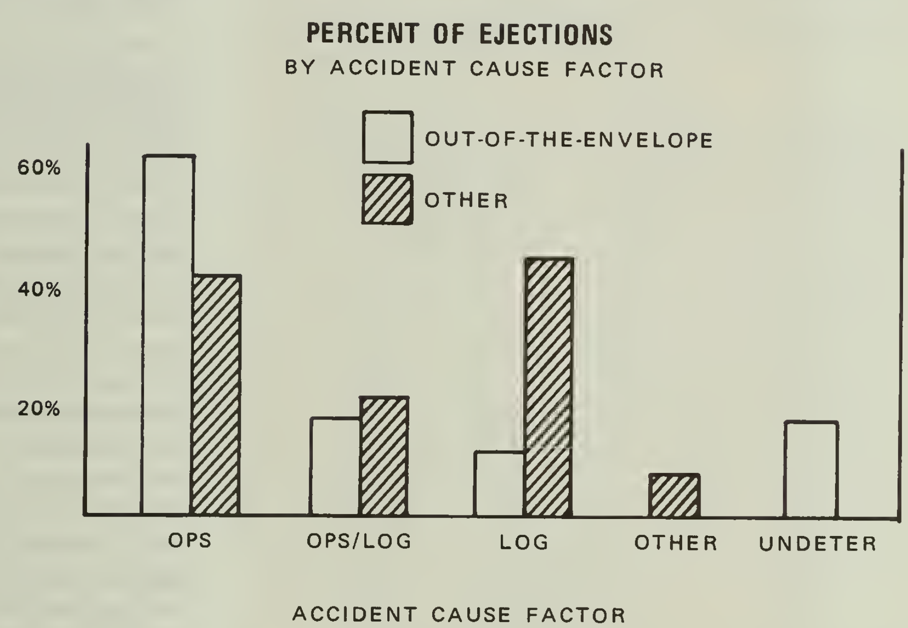


Fig. 3

the former dies because he tried just a little too long, whereas the latter usually lives to tell about it.

There are probably several things that can cause a pilot to delay his ejection. Either consciously or subconsciously, things such as mission dedication, stigma, ego, career impact, fear of the unknown (ejection environment), etc., invariably come into consideration. In the final analysis, though, all of these can be overcome to some degree, but the alternative—an ejection fatality—has absolutely no appeal process. So, When You Gotta Go—Go! ★

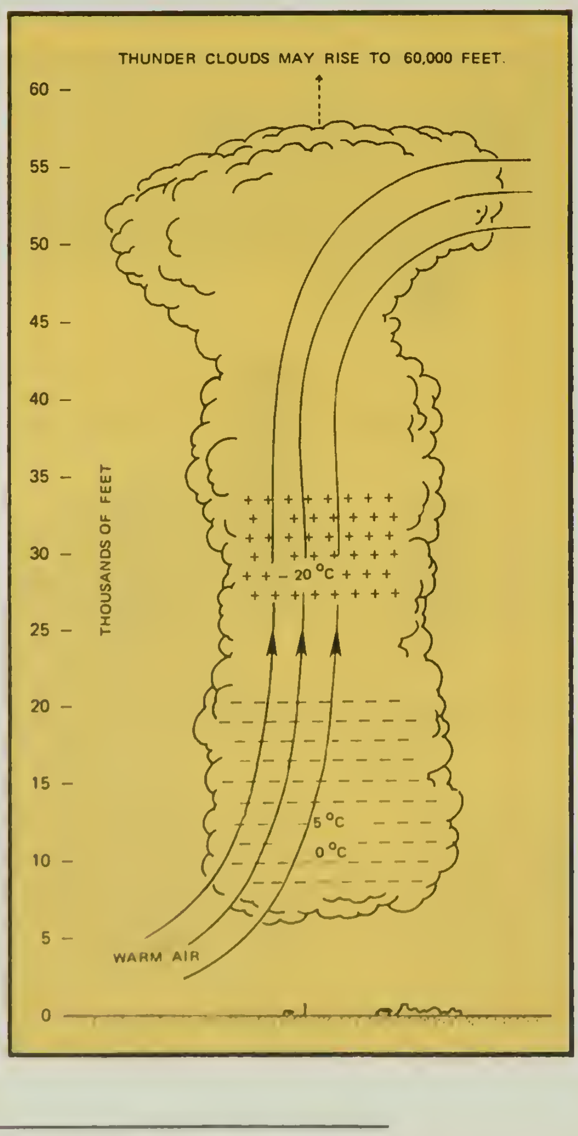
After this article appeared in Aerospace Safety *in June 1977, we had a rash of requests for permission to reprint. We think this is one of the best things on lightning we've read, so it's offered again. Good reading.*

Even though April, May and June are the worst months for lightning strikes, some are reported in each of the other months, too, and to some of you with many flight hours, these encounters may seem routine.

But on very rare occasions lightning has brou plane out of the sky, and on less rare occasions caused some very frightening close calls. Thus well to review what lightning is, why your a sometimes gets involved with it, what to expect fr and how you can help researchers learn more it and design even better protection from its in the future.

Lightning And

FIG. 1



A lightning flash is a very long electrica which extends between one center of e charge in a cloud and another center of polarity charge in the ground, in another cl sometimes even in the same cloud. The ene produces lightning is provided by warm air ri wards into a developing cloud as shown in F

As the air rises, it becomes cooler and at point its excess water vapor condenses into wat lets, forming the cloud. When the air has ris enough for the temperature to have dropped t 40°C, all of the water vapor will have frozen Some of the ice crystals coalesce into hailstone are heavy enough to fall through the cloud, g supercooled water droplets as they do so. A to one theory, as these droplets freeze onto hailstone, small splinters of ice chip off, carryi with them a positive charge and leaving the with a negative charge. The vertical air curren the ice splinters to the upward part of the clou ing the base of the cloud with a negative charg The air currents and electrical charges tend to tained in localized cells, and there may be such cells in a single cloud.

Surrounding any electrical charge is an elec which extends outward a long distance from th itself. Close to the cloud charge center the elec is very intense, and when sufficient charge h mulated, this field may be strong enough to *io* air, creating a conducting path in the form of nous spark which jumps outward towards a r

FIG. 2

rged or oppositely charged air. Some of the e from the cloud flows along this spark, charging column of air, perhaps a meter in diameter around park, and intensifying the electric field in front of is causes more ionization and further extension spark, and the process repeats itself for many ions and forms a zig-zagging, luminous column ized air called the *stepped leader*. The leader r zags about 50 meters in each step, travelling

Aircraft

MR. J. A. PLUMER, General Electric Co, Pittsfield, MA

ut 100,000 meters per second, and pausing for 50 millionths of a second between steps while it plied with more charge from the cloud.

the stepped leader approaches the earth, it at- electrical charges of opposite (positive) polarity roduces ionization from sharp objects such as ildings and trees. Fed by the attracted charges, called *streamers* emanate from these points and gate upward a short way to meet the downcom- ader. When the two meet, a conducting path is d so that the charge in the leader can combine with the opposite polarity charges in the ground.

process thus far takes only a few thousandths econd to accomplish. When it begins, the leader in the general direction of an opposite polarity source, but it does not "know" where it will fi- trike. There may be several possibilities, and the frequently splits into several *branches* on its s happened in the flash of Figure 2. The first that reaches a source of opposite charge com- the path and wins the race, so to speak. The that began the flash of Figure 2 found this op- charge in the earth, but it might also have found nother cloud, or even within the same cloud as ginal source of charge. When the leader reaches ound (or other opposite charge center), the posi- arge in the ground rapidly flows into the leader, lizing the negative charge in it from the ground e head of the region in which this neutralization place moves up the leader channel at a velocity of 100 million meters per second—creating a current which reaches, on occasion, as high as 200,000 amperes. This current is called the *return stroke* and is responsible for the bright flash and loud noise we associate with lightning.

Once it reaches the cloud, the return stroke dies out but the charge remaining in the cloud may drain off through the conducting channel to ground, forming *continuing currents*. If additional charge centers are present in the cloud, they may also discharge to ground through the same channel, forming additional strokes, called *restrikes*. Neither the return stroke nor the restrikes last for more than a few thousandths of a second. The continuing currents are of lower amplitude—a few hundred amperes—but last for a much longer time than the strokes. Together, the strokes and continuing currents make up the complete lightning *flash* and flashes may persist for up to a full second. If more than one stroke occurs, the main channel will brighten during each one, causing the channel to flicker.

If your aircraft happens to be near a charge center or an advancing leader, the electric field around the aircraft may be intense enough to ionize the air about its extremities. This ionization often occurs in the form of a corona—a bluish glow visible at night and frequently called St. Elmo's fire. If sufficiently intense, streamers may also form and propagate outward from the aircraft toward the leader or charge center. As this happens, the intervening field will become even more intense and the leader may advance more directly to-

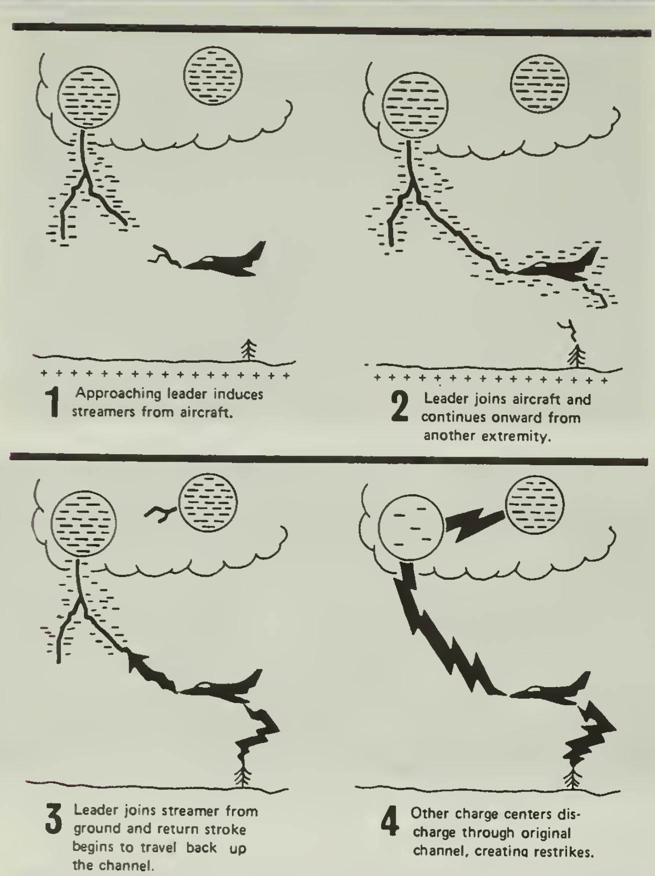


FIG. 3 Strike Sequence

ward the aircraft and meet one of the streamers emanating from it, completing a conducting path through which charge may flow onto the aircraft. Since there is not room for very much charge to remain on an aircraft, charge will "overflow" in the form of intense streamers from other extremities and enable the leader to progress onward, as shown in the sequence of Figure 3.

Thus, your aircraft becomes a link in the conducting channel from the cloud to the ground or another cloud. Whatever strokes and continuing currents pass through the channel will also have to be conducted through your aircraft.

Once within its clutches, you cannot fly away from a lightning flash. When the return stroke passes through the channel, you will experience the bright flash and loud bang so often reported. You will be "let go" only when the flash dies out naturally.

From your perspective in the cockpit, the foregoing events may appear to be caused by the aircraft becoming charged up by some other process and then suddenly discharging itself into the surrounding air, accompanied by a bright flash and loud bang. Sometimes at night the corona and streamering will persist and brighten for many seconds, appearing as a fluct column of fire snaking outward from the nose aircraft. When the flash finally occurs, the coro streamering cease because the electric field ha lapsed, and it appears as if the aircraft has su discharged. Hence the event is termed a *static dis* and not a lightning strike. However, a rather amount of electrical charge is necessary to pr either a bright flash or a loud bang—far more th be stored on an aircraft, so if either of these sym occur, you almost certainly have been struck by ning. In fact, the loud bang does not even occ some strikes; only a "whoosh" sound. This is th to be a cloud-to-cloud flash whose return stroke less rapidly, producing less current and noise.

WHAT PARTS OF AN AIRCRAFT GET HI

Since it will be part of a path between two c centers, there will always be at least one entry an exit point on your aircraft. *Initially,* these are from which streamers came during the leader described earlier, and may be any of the extre such as the nose, wing tips, horizontal or vertical lizer tips, tail cones and, somewhat less frequ other protrusions such as propellers and blad tennas.

But, an aircraft flies quite a distance during th time of the total flash, and this may expose othe faces to flash attachment. A flash striking the nos example, may reattach at successive points alon fuselage until a trailing edge is reached, where i then remain until the flash dies. If an initial at ment point was already at a trailing edge, the flas simply hang on there. Figure 4 illustrates this pr and shows other likely attachment points on a ty aircraft. *(Continued on pag*

FIG. 4 Lightning Attachment Points

OPS TOPICS

AEDALIANS IEET

The Order of Daedalians, the National Fraternity of Military Pilots, is holding its annual convention 1-3 June, in San Antonio, Texas. The Order, founded in 1934, will honor its over 350 Founder Members (commissioned pilots of heavier-than-air aircraft prior to November 11, 1918). Business meetings, safety award presentations, and social events are also planned for the 3-day convention. For further information contact Colonel Robert E. Morris, USAF (Ret), (512) 924-9485.

ILOT TO TC TRANS-ISSIONS

We've covered this subject before, but let's reinforce it with an actual case: Indianapolis Center cleared TWA 373 to descend from FL 310 to FL 280. The crew received the clearance, but they understood the assigned altitude to be FL 230. The first officer promptly acknowledged as follows, "two-three-zero TWA three seventy-three." The controller only received the second part of the transmission, that is, "TWA three seventy-three." The controller assumed it to be an acknowledgement of the FL 280 altitude assignment. The mistake went unnoticed until the descending TWA 373 nearly hit TWA 516, cruising at FL 270. The Airman's Information Manual is very specific in its section on "Radio Communications Phraseology and Techniques." Call sign first—then repeat the clearance. It was written that way to avoid a situation exactly like this one.—Courtesy *Flight Safety Focus.*

HAT IS CAP?

CAP is the Civil Air Patrol. In 1977, they recorded one of their most successful years ever. These civilian volunteers are an auxiliary of the US Air Force, and are the only national organization specifically trained and equipped to perform air search. Last year, CAP was directly responsible for saving the lives of 52 persons, and they successfully accomplished 446 finds (search objectives located). This 63,000 member organization has units in all 50 states, the District of Columbia and Puerto Rico. Additionally, the CAP cadet program provides a vehicle for the study of aviation and space related subjects, as well as leadership training, for thousands of teenage Americans.

ALUE YOUR AIL?

A C-130 was on a support mission to a remote site outside the CONUS. A maximum effort takeoff was made on a specific runway required in the approach plates and IFR supplement. The runway had a downslope gradient of up to 12 percent. The crew members didn't notice anything unusual about the takeoff. However, on postflight inspection at their home base, the maintenance people discovered some damage to the tail skid and urinal drains. Runway gradients can tell you something about your takeoff and landing attitude.—Maj John D. Woodruff, Directorate of Aerospace Safety. ★

FLY THE OAT

COLONEL THOMAS H. YATES • CAPTAIN TERRY W. JOHNSON, EUCARF

Captain Bob Jones relaxed as the Starlifter's Autopilot engaged and set the big bird on a steady climb up into the starlit night. It was going to be a routine 3-day Europe run; so routine in fact that it was almost boring. Two-pallet off-load at Prestwick Airport, Scotland; RON at Mildenhall, shuttle hop to Rhein-Main and back, RON and RTB in time for the Wing Thing at the Club on Saturday. Besides that, his date for Saturday was the newest s sation in the flight nurses sect

Just before changing frequ cies to enroute center control, heard MAC 234 checking in. M 234, piloted by his roommate, Bill Smith, was on the same m sion profile. Bill had threatened move in on the new nurse if b got held over on maintenance lays beyond the 3 day TDY. E had heard rumors of a proba "industrial action" among U

raffic Control personnel and possibility of "sympathy slow-ns/strikes" on the continent. trivia however was of slight ern to the fearless aviator had flown through the worst SEA had to offer. Alas, five -pounding, bone-weary days he dragged his hang-up bag gh the front entrance of his 5 days!! How could this en?

e transatlantic flight had been entful until they were handed om Oceanic to Domestic Con-The one hour holding pattern approach clearance due to ATC industrial actions (slow-s) had been irritating, and ree hour departure delay had hem beyond crew duty day, g an RON at Prestwick. A our departure delay the next ut them into Mildenhall too for the scheduled shuttle to -Main, delaying them until ext day. The three-hour round flight turned out to be over ours from crew brief to de- due to multi-hour delays in rture clearances and lengthy oach delays.

the way back across the At-, Bob was mumbling some- about lousy air traffic con-rs who are supposed to be ding a service, but instead isrupting the best laid plans ice and men. The last straw when he stumbled through OQ door and saw his room-, refreshed after two days of rest following the TDY, sit-on the sofa with his prospec-ew nurse friend.

ow in the world did you do Bob mumbled. "Simple," ex-ed the more Europe-wise sen-ilot, "when we coasted in and vered all the delays and prob- due to ATC disruptions, we OAT and experienced no delays on the whole mission." "OAT," said an exasperated Bob, "that sounds like something to feed horses or eat for breakfast."

The names and times in the above scenario may be fictitious, but the places and circumstances are based on composite experiences of USAF aircrews. A good basic understanding of the air traffic control system in Northern Europe can permit miltary flights to circumvent disruptions within the civilian air traffic control environment and complete their mission on time.

The United Kingdom, Netherlands, Belgium, Luxemburg, Germany and France all have a dual enroute air traffic control system, one civilian and one military, known respectively as General Air Traffic (GAT) and operational Air Traffic (OAT). Generally speaking, aircraft flying on published air routes (other than TACAN) are controlled by civilian ATC personnel. Aircraft flying on TACAN routes or point to point off airways are controlled by miltary controllers. The OAT ATC system is not subject to the slowdowns, sick outs, strikes, etc., of the GAT system. Equipment, phraseology, and aircraft separation standards are the same for both civil and military controllers. In some of these countries civil and military controllers are even co-located in the same building. The OAT and GAT systems are fully coordinated and aircraft operating under one system can be safely transited through airspace controlled by the other system.

OAT is for military aircraft only and is intended primarily to facilitate movement of aircraft that, because of communications equipment, navigational equipment, or operational and mission characteristics, are not wholly compatible with the civil GAT system. However, military aircraft, such as the airlifters, SAM, VIP, etc., that can fly GAT are not prohibited from flying OAT. (Note: OAT in France is restricted to fighter type aircraft.) During periods of civil ATC disruption within the GAT system, all military aircraft may file OAT and avoid the restrictions and delays placed upon GAT traffic.

The OAT capability is generally available in the enroute altitude strata only, although in the UK, France and Netherlands, OAT can be filed from takeoff. In Germany in the miltary TMAs (Eifel and Ramstein) aircraft may also depart OAT. In the absence of OAT availability up to the enroute system, a composite GAT/OAT flight plan may be filed. In this instance the changeover point should be a NAVAID to facilitate inter-system coordination and hand-off. The OAT controller will automatically transfer aircraft to the appropriate terminal arrival controlling agency.

Additional information on OAT routings, applicable altitudes, filing procedures, and ICAO addressee identifiers for flight plans, are contained in the DOD FLIP AP/2. Aircrew members should periodically fly OAT in Europe to familiarize themselves with the procedures, flex the system, and be prepared for the next time the air traffic control slowdown whistle blows. Your knowledge of these dual ATC systems will provide you viable alternatives in any situation so that you can continue flying and airlifting.

The European Central Reservation Altitude Facility (EUCARF) Rhein-Main Air Base, Germany, was established in 1973. It provides altitude reservations for inter-theatre movement of large scale DOD aircraft forces within the European, North Atlantic, Midle Eastern and North African theatre. ★

USAF IFC APPROACH

Altimeters are probably one of the least understood instruments installed in our aircraft. Pressure altimeters are calibrated to indicate true altitude under international standard atmosphere conditions, and any deviation from this standard will result in an erroneous reading on the altimeter. When the temperature is colder than standard, this error will cause the aircraft to be lower than indicated on the altimeter. The amount lower will depend on the difference between the standard temperature for that altitude and the actual temperature. This difference equates to approximately four feet per thousand feet for each degree Celsius of difference. The Canadian IFR Supplement (GPH205) prints a Temperature Correction Chart for use by the pilot in determining the amount of error he can expect when colder than standard temperatures are encountered. The chart is printed here for your perusal along with the example given in the IFR Supplement on how to employ the chart.

As can be seen, the errors in the altimeter can be quite significant, especially with high MDAs or l and extremely low temperatures. This chart tested by flying aircraft to PAR and ILS glide p interception points. When chart corrections were plied, the aircraft intercepted the glidepaths at correct heights. Without corrections applied, aircraft intercepted the glidepaths at altitudes lo than normal. We thought you might like to be m aware of this chart in case you ever fly in cold t peratures. It should be noted that Canadian pi are not required to use this chart, but are enco aged to do so.

Since the error increases with altitude, remem that this can also be applied to the enroute port of flight, i.e., when operating in areas of cold t perature and uneven terrain, you should file for altitude above the minimum IFR altitude. Get a g weather briefing and be aware that often someth as subtle as temperature can make a big differe in where you are with respect to the terrain you flying through.

Fig. 1

TEMPERATURE CORRECTION CHART

AERODROME TEMP °C									
0	0	20	20	20	40	40	40	40	60
-10	20	20	40	40	60	60	80	80	80
-20	20	40	60	60	80	100	100	120	140
-30	40	60	60	80	100	120	140	160	180
-40	40	60	80	100	120	140	160	200	220
-50	60	80	100	120	160	180	200	220	260
HAT or HAA	200	300	400	500	600	700	800	900	1000

Due to altimeter error in extreme cold weather, the values derived from this chart should be added to the published DH or MDA by the pilot to ensure adequate obstacle clearance.

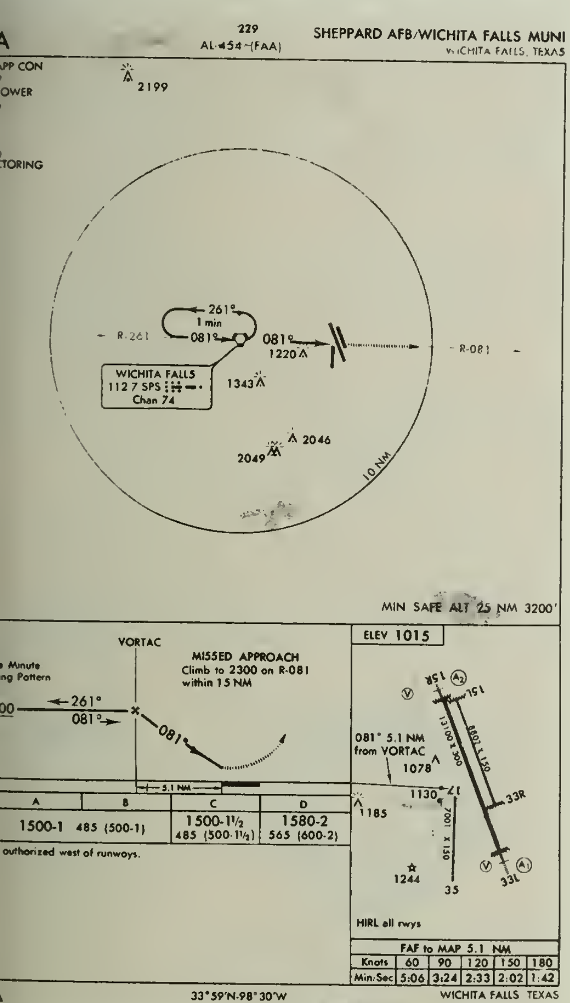
Example: On a Hi TACAN rwy 36 approach at Winnipeg Elevation 783' ASL

Published MDA 1180' ASL
HAT 397
Temp -30°C
Correction 60'
MDA to use -1180 + 60 = 1240' ASL

By the USAF Instrument Flight Center
Randolph AFB, Texas 78148

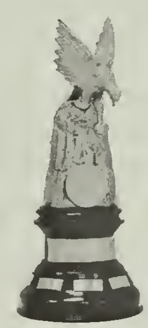
have been cleared to Wichita Falls VORTAC the Southwest on a heading of 040° at 3,500 (see Figure 4). Approaching the VORTAC, I am cleared for the approach. When can I commence ent to 2,300 feet?

he last assigned altitude must be maintained on a published portion of the approach proe. In the case of Holding in Lieu of a Procedure the holding pattern is part of the published ach procedure; therefore, once established in olding pattern (which, in this case, would be RTAC passage) descent may be accomplished 3,500 feet to 2,300 feet.



Q. I have been cleared to Wichita Falls VORTAC from the Southwest to hold in the depicted holding pattern (see Figure 2). After turning outbound to 261° on VORTAC passage, I am then cleared for the approach. If my airspeed is in excess of 180 KTAS, must I then correct back toward the holding course using an intercept angle of at least 20° as stated in AFM 51-37?

A. No. The note in AFM 51-37 after paragraph 6-12c is being deleted in Change 1 to AFM 51-37. This is being done to bring holding in-lieu-of procedures in alignment with normal holding pattern procedures. ★



SAFETY AWARDS NEWS

Congrats! It was recently announced that the Air Defense Weapons Center (ADCOM) located at Tyndall AFB, Florida, has been selected as the USAF winner of the System of Cooperation Among Air Forces of the Americas Flight Safety Award (SICOFFA) for 1977. The Air Defense Weapons Center was selected from a total of eight USAF nominations to receive the award which recognizes outstanding accomplishments in aircraft accident prevention.

* * *

A new safety award has been created and is in the development stage! When approved, the "Director of Aerospace Safety Special Achievement Award" will be presented annually to one individual or one organization for outstanding safety contributions or achievements. All military organizations (MAJCOM and below), all USAF military personnel (O-6 and below), and all USAF civilian employees will be eligible! Watch for more details; we'll keep you posted! ★

BACKACHE IN HELICOPTER PILOT

MAJ RON GOEDE
Base Surgeon
CFB Portage La Prairie, Canada

One does not have to spend much time in a helicopter squadron flight room before it becomes very obvious that a large number of helicopter pilots suffer from chronic backache. In fact, this author has on occasion experienced low back pain on some especially long trips in the Kiowa helicopter.

A French researcher found that 87.5% of helicopter pilots investigated, all of whom had at least 500 hrs, suffered from backache while flying. While the majority experienced pain in the region of the lower spine, the incidence of neck pain was also high. He found that the pains started after approximately 300 hrs of flying and were more likely to occur if the previous intensity of flying had been high. It was interesting to note that in pilots with co-existing spinal disease, the pain appeared between the 50th and 100th hr. Once the symptoms were established, any flight which was prolonged or difficult brought on the pain. This was especially true of flights which required considerable concentration by the pilot, i.e., confined area operations.

The development of symptoms is basically a function of the flying intensity. The flying rate which seems most likely to promote back pain is more than 5 hrs per day, more than 40-50 hrs per month.

There appear to be two factors which promote the occurrence of back pain, the posture of the pilot and the vibration generated by the machine.

POSTURE

The unique control system in the helicopter requires the adoption of an abnormal sitting posture by the pilot.

In order to control the collective, the pilot is obliged to lean to the left. The left hand, which activates the collective lever, is half flexed. The right arm, which activates the cyclic, is bent at the elbow, almost at right angles. Generally the handle is too high for the forearm to rest on the thigh. Hence the pilot holds his hand as low as possible to compensate.

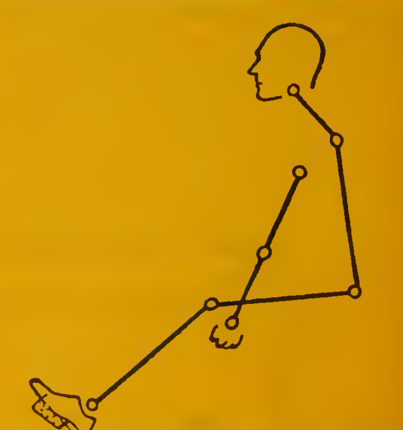
The pilot then hunches over the cyclic (fig. 1) and as a result, the spine is moved away from the back of the seat rest and cannot be supported by it. In order to see over the instrument panel, the pilot must hold his head tilted slightly upwards. Th especially true of shorter pilots.

The lower limb rests on the rotor pedals wit legs and thighs slightly flexed. The knee is t and maintaining this posture over long perio time causes fatigue.

This posture is bad because the position is asymmetrical and the pilot is forced to maint for the duration of the flight. It is this constant of tension in the musculature that results in the tual production of pain.

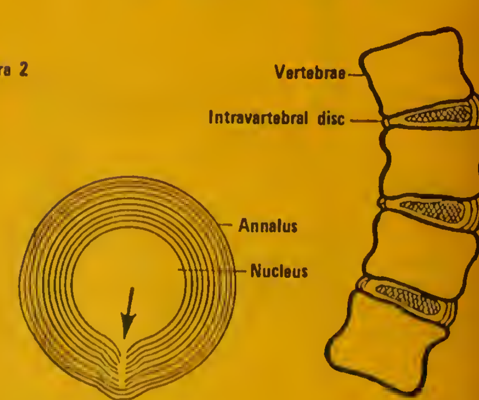
The sitting position adopted tends to pres vertebral bodies together at the front and pull apart towards the back (fig. 2). This differen

Fig. 1.



Posture adopted by helicopter pilots.

Figure 2



Radial tear of annalus

aulic pressure on the inter-vertebral discs will to force the nucleus of the disc rearwards.

g. 2 depicts radial tears in the anulus (washer) result of the aging process and repeated trauma. e begin centrally and near the nucleus (ball bear- and progress outwardly. Due to the uneven hy- ic pressures within the nucleus, the torn ends e fibre are forced outwards, when these tears the outer margin of the discs, they can produce ge. Now the conditions are prime for a minor s, i.e., hard landing, to "tip the scales" and pitate a complete prolapse of the disc.

e spine of the helicopter pilot, weakened by rous small injuries, is particularly vulnerable to nerative injuries to the fibro-cartilage of the These injuries set the stage for the ultimate sion of the nucleus rearward. This will irritate gamentary system, and even the nerve roots, ing in back pain.

the case of heavy or crash landings, this vul- le posture may cause serious injuries to the ver- , i.e., compression or chip fractures.

TION

rations are considerable in helicopters. These ne greatly intensified on takeoff and landings. are complex, of varying frequencies, and signi- in the vertical, lateral, and horizontal axis. pter vibrations arise from a number of me- al sources.

ations in the 3-12 HZ range are induced by blades, the frequency being related to the num- blades. Tail rotors induce high frequency vi- ns in the 20-25 HZ.

lowest tolerance of the human body to vibra- in the 4-8 HZ range due to the amplification ation by the natural resonance of the human

ndamental problem is vibration isolation be- the rotor and fuselage. Excitation of the fuse- low frequency rotor vibrations adversely af- craft controls, subsystem operations and crew t.

ts to reduce oscillatory forces have had limit- cess. Tailoring the rotor and/or fuselage to esonance is usually attempted. Some form of n system is also desirable. This is particu- ue of two bladed rotors because of the low cy and high magnitude of the rotor hub produced.

tions are transmitted to the pilot through and the seat. The magnitude and frequency rom one machine to the other.

From a mechanical point of view the human body is a complex elastic structure in which visco-elastic soft tissue elements are supported and coupled to the skeleton, made of bone, and behaving more like a solid.

The human body is considered as a system of suspended masses separated by springs. When excited with certain input frequencies, resonance of the body parts can occur, i.e., the deformation or displacement of body organs is much larger at resonant frequencies than at other frequencies. Changes of phase of resonance will act particularly on lumbar discs. Supporting musculature "springs", must consistently work to absorb the vibration and hence rapidly become the source of the pain.

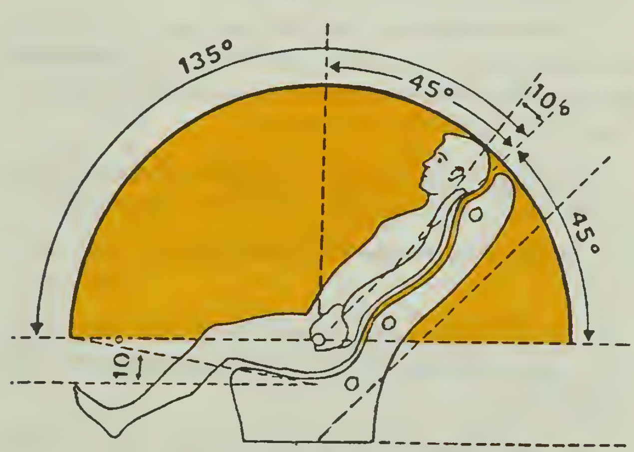
The chronic effects on the disc itself have already been described. The load on the spinal system will increase the problems already caused by the vulnerable posture.

Poor posture and vibration therefore are the two main causes of low back pain experienced by helicopter pilots. However, one must take into consideration the frequent minor injuries of the spines of the pilots, as a result of poor posture, and their resultant long term effects.

PREVENTIVE MEASURES

The most ideal method of preventing back pain and spinal injury in helicopter pilots would be to ensure adequate human engineering at the time of design conception. For example, helicopter controls can be redesigned to improve the posture adopted by the pilot.

The cyclic control should be close enough to the body and its handle sufficiently low for the forearm to rest on the right thigh.



Relaxed sitting posture according to Krämer.

Backache In Helicopter Pilots continued

The length and travel of the collective control should be such that it would prevent the body from being tilted to the left. Adequate support should be given to the left elbow.

The rotor pedals should be adjustable, not only fore and aft but vertically as well, to ensure that the foot forms a right angle with the leg and the heel can rest on the floor. The instrument panel should not restrict the field of view and must be sufficiently close to the pilot so that the reading of the instruments does not cause an accentuation of the forward leaning position.

The seat should be adjustable, not only fore and aft but vertically as well. The wide range in the size of helicopter pilots will bear this out.

The seat back should match the contour of the human spine. An adjustable lumbar support would ensure the retention of the normal curvature of the lumbar spine and prevent the forward bowing of the spine as a whole.

The seat cushion should be of such shape that it would give a certain degree of support to the thighs. There should also be design considerations to prevent transfer of vibration from the airframe to the pilot and to attenuate decelerative crash forces.

REMEDIAL ACTION

Remedying the pain is an immediate problem: present helicopters will remain in service for a long time without any possibility of retro-fit modifications.

Since helicopter pilots will have to live with the current design for some time, there are numerous remedial programs that can be undertaken to delay the onset of back pain and minimize the degeneration of the structures of the spine.

- There should be adequate medical screening of potential helicopter pilots, including x-ray examination of the spine, to rule out pre-existing spinal disease and deformity.
- Flying hours should be limited to a maximum of five hours per day and fifty hours per month.
- Provisions of lightweight helmets for helicopter pilots.
- Rotary wing tours should alternate with fixed wing tours to prevent the rapid accumulation of helicopter hours.
- Pilots should maintain their ideal body weight to prevent added stresses on the spine.

Figure 3A
Spinal column in upright position

3B Same subject in sitting position adopted by helicopter pilots.

3C Same subject
position wi
pad

- Pilots should undertake regular exercise
grams designed to strengthen their abdomina
spinal musculatures and increase flexibility.

Studies conducted by Beach and Killus o
German Air Force Institute of Aviation Me
demonstrated that seat positions are better tole
for prolonged periods if the forward protrusion
lumbar spine is encouraged and supported (fi

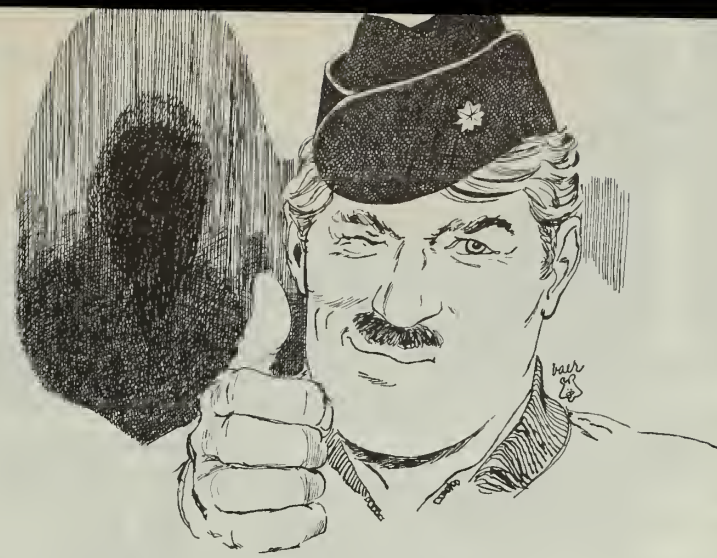
This can be accomplished by a custom des
lumbar cushion of approximately 8 cm thick and
enough to support the full lumbar region. This
be attached to the seat back with velcro fast
and adjusted to a height suitable for the part
pilot.

CONCLUSION

It has become evident to most helicopter
that very little human engineering has gone int
design of cockpits. Helicopters are making u
ever increasing percentage of Canadian Armed F
aircraft inventory. Both the pilots of Rotary
Aircraft and the medical profession should e
that the inadequacies of our current inventor
not repeated in future generations of helicopter

In the interim, the remedial measures out
should be encouraged. These would delay the
of back pain experienced by Rotary Wing pilots
minimize the permanent damage produced.—
tesy **Flight Comment**, Canadian Armed Forces

The Day Charlie Died



TAIN DAVID V. FROEHLICH
torate of Aerospace Safety

or's Note: Charlie is a ficti- flyer. He is the guy who sat left seat, flew on my wing North," yelled at me from the seat or hovered over me while pulled up on a cable. Charlie aviator who has the mental hysical ability and skill. but gh some disregard of rules, or flight discipline, he kills lf (and mayhaps others). of us who fly, either have n or will know, a Charlie, he kills himself.

narlie was a good stick! He was always the tightest in ormation when we flew white s at Laughlin airpatch. His gs and acro were used as les of perfection when the us were getting the UPT w! When it came time for dgling aviators to leave the —UPT nest, he got a "fan- Phantom" when I (and) headed for "Buffs." Charlie o sunny Miami (HST) for his and true to form, he garnered OP GUN and other ace of se awards. Good stick! No Charlie's reputation grew headed west across the pond our in "the only war we've He progressed from Blue 4 Blue Lead and got himself for 800 trucks, two sampans couple of MIGs. When he ed stateside, he walked back e old niche at the squadron IP. flight commander and er of young lieutenants." The only problem Charlie had was that he couldn't follow "those dumb peacetime rules." One of them killed Charlie.

It was in November, about a year after Charlie's return to the states. The mission was a night range sortie, and he was lead. His briefing to the other seven Phantom riders contained most of the required items, but there was also a notable number of references to "the way we did it in SEA," and "we've got good weather, so that's no sweat." There were no questions from the flight (Charlie had a way of briefing which dis- couraged "dumb" questions).

The group piled into the blue bread truck and arrived at their aircraft on time. Charlie rushed his usually sketchy preflight, but found nothing amiss and was ready for the prestart check-in about 5 early. "Damn, three's crying about an electrical problem and says he won't be able to start on time. Well, we'll start without him, and he can meet us in the arming area. I don't need another late takeoff or missed range time. On top of that, I've got a new brown-bar in the back. Means I'm going to have to do it all myself.

"What? Oh, yeah! Crosscheck the altimeters! Mine reads. . . . What? 280 feet different? Well, it's okay! We'll watch 'em when we get airborne. Yes!! I know it's out of tolerance. I said we'd check 'em again later!!"

"Blue Flight check! 2, . . . 4. Damn it! Where's three?"

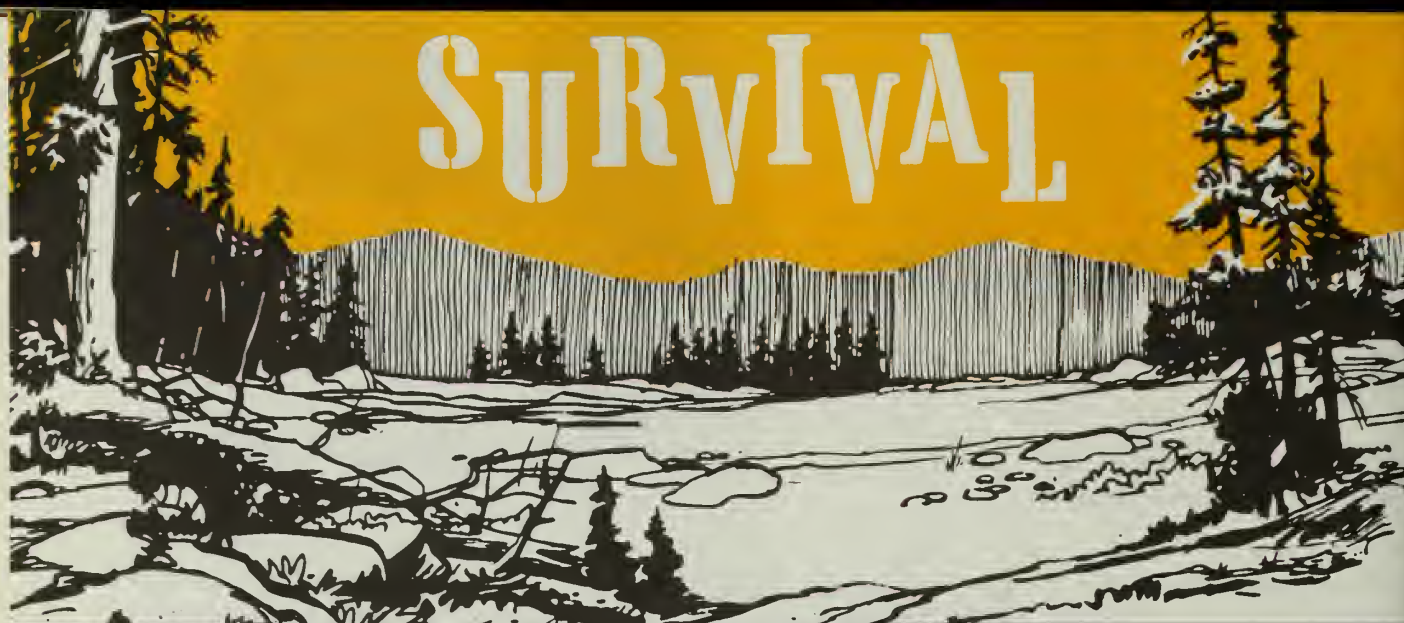
"Lead, this is 3. Maintenance says ETIC is 20 minutes."

"Okay, three; we're gonna go! You can catch up with us! I'll tell center you'll be coming."

Later, there are three F-4s winging their way to the range. The descent checks have been ac- complished. Charlie's altimeter is still out of tolerance, but he has dismissed that as a minor problem since "it is a good clear night" and he has more to worry about anyway. His range time will be good, but three hasn't arrived yet! Preoccupied with the range, center and three, Charlie "rogers" the back seater's reminder about re- setting the altimeter for the range. Charlie rolls in for the first one.

"What? Yeah, I set it! Yours says what? No, we're okay. I've got a good visual on the target! Down the chute and a little extra pull will get us out with plenty of. . . ."

An altimeter killed Charlie. The cause will be "undetermined." The entire squadron will testify as to Charlie's flying ability. His wife states that "no, there were no problems at home and, yes, he had good meals and plenty of rest." The accident board picked through the smoking hole, but could only find a few gauges and miscellane- ous parts. CAUSE: UNDETER- MINED. That was the first day that Charlie died. ★



FAT AND HAPPY

SGT HERBERT A. KUEKER | Operations and Requirements Branch
3636th Combat Crew Training Wing (ATC) • Fairchild AFB, WA

Bill Winston gazed across the table at his wife and children and thought of how well he had done over the years. With his children almost out of high school, the mortgage on his home almost paid, this recently retired Air Force Chief Master Sergeant was securely situated in his community and justly proud of his accomplishments. As the family dinner prayer was said, and they all began to eat, Winston thought of other times—times not quite as serene.

His thoughts went back to a time in his military career when he was a 26-year-old staff sergeant.

He recalled that as a member of the Air Sea Rescue Service he was enroute to a training exercise in some nearby mountains in an H-19 helicopter. There were transmission problems—the helicopter went down.

After an unknown period of unconsciousness, he discovered he was the only survivor of the mishap. After somewhat overcoming the stunned feeling from this unexpected turn of events, he started getting his stuff together. Having laid out his signal in a nearby meadow, he waited for four days—miserably crouched next to some rocks. His hunger became noticeable on the second day. He surprisingly discovered obtaining food by killing a small bird with a rock was a piece of cake. The gut wrenching vomiting associated with eating the raw meat was almost more than he could stand. Procuring the meat was easy, but not knowing how to adequately prepare it made the food virtually useless. As a matter of fact, it compounded the problems he already had. By the fourth day, he decided that he had to walk out or starve.

The next three weeks weren't pretty!

He began walking. He roamed from one mountain ridge to another, continuously violating a cardinal rule of survival by traveling without purpose and not knowing where he was going. He just had to do something and moving seemed to be the thing to do.

The exact series of events that went on during those three wee were still kind of fuzzy in his mind. The part he can vividly recall was when he was finally found by the rescue party. He recalls that moment very clearly and how thankful he was to be alive—barely.

Many people have encounte the possibility of starvation. So were able to adequately deal w it, others weren't. With today's quick rescue capability, starvat isn't a major problem—at least in peacetime. However, in an extended survival environment the knowledge of how to prep food for consumption could sa your life.

As Bill had found, in most a of the world, finding or procur animals and edible plant life is relatively simple—the catch is, most people aren't knowledgea on how to prepare the food after they have obtained it. Almost all food stuffs you may obtain in sort of situation require some s of preparation prior to its consumption. Consequently, it is essential for all of us to know so

about "primitive" cooking
ds.

n though the methods of
reparation are limitless, a
or should keep the efficiency
n method in the back of his
Remember that boiling,
g, baking and frying, in
der, are the most efficient
o prepare food. Boiling is
esirable because you can
ne broth the food was cooked
thus, retain a majority of
rients that have been cooked
the food. Each of the other
s wastes food nutrients due
oss of fluids or by burn-
food.

e the method has been
l you must determine what
container can best be used
are the food. There are
which are easy to construct.
e who has been through the
rce Survival School will
er how to lash an empty
an to a stick to make a
ooking pot. Just remember
the ration can on the end
he opening key is soldered.
d has been weakened by
ering process and could
rough if exposed to heat.

asy way to fry food over
fire is to wrap heavy
m foil around a stick with
Y in it. Holding on to the
you can easily fry meats
improvised aluminum
ng pan. (I would recom-
l aircrew members carry
eet of aluminum foil folded
eir personal survival kit.)
ng spit can easily be made
ny small limb, of a type
hich leaves no bitter taste
e bark is removed—such
e. Place the meat securely
ick and prepare a fire
hot enough to cook on,
so hot that it would burn
. Throw a handful of
ves or small, dead twigs
coals, causing a flare-up.
ck flame will sear the
meat and seal in any tasty juices.

Always roast meat as fast as possible to avoid toughness. Boiling the meat from animals such as deer, fox, and other larger animals for a few moments prior to roasting will eliminate some of the toughness from the meat.

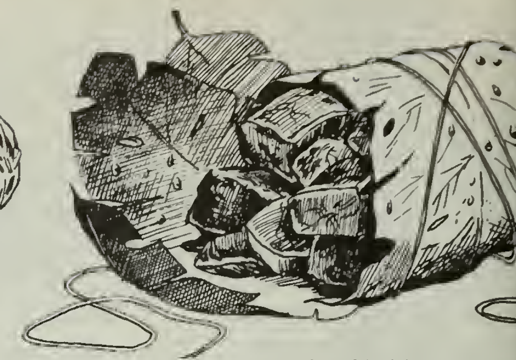
Boiling is just as easy as frying, but requires a better container for the food. As I mentioned earlier, containers for boiling can be made from a ration can, or if clay can be found in your area, pottery. With the exception of your ration tins, other alternatives will require considerable work, but are feasible if you want to take the time to construct them. Additionally, birch bark and other peeled barks which are very pliable can be folded into a container for boiling. Just remember, when cooking with this type of wooden container, place it near the edge of the fire away from any flames so the container itself doesn't catch on fire. Check your AFM 64-5 for other ideas.

There are certain things to remember when boiling foods that may enhance the edibility of the sustenance as well as benefit you physically. First, when cooking plants such as dandelions, bistort or the like, leach them (boiling the plant in several changes of water) thoroughly to eliminate some of the bitter taste. Another idea is to drink the water you have used to boil meat, since this broth contains all the nutrients extracted by the boiling process.

Much can be said in favor of baking foods in a survival situation. The primary advantage, be it plant or animal life, is the lack of a requirement for a cooking container. Have you ever considered coating meats such as fish, venison, birds, and small game animals with a half-inch layer of mud and placing them into the fire coals to bake? This procedure hardens the mud and

BAKING GAME
IN MUD MIXED WITH
GRASSES – ½" THICK

BAKING USING
HEAVY DUTY
ALUMINUM FOIL
(INCLUDE THIS IN YOUR
PERSONAL SURVIVAL GEAR)



BAKING GAME
WRAPPED IN LARGE WET
LEAVES. (PLACE DIRT OVER
AND LEAVE OVERNIGHT.)

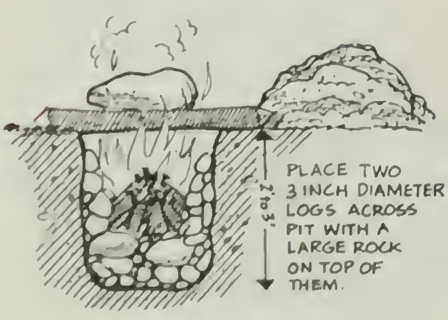
SURVIVAL: FAT AND HAPPY continued

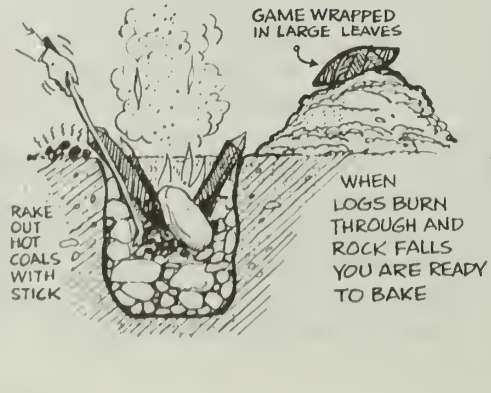
cooks the meat allowing the mud to be flaked off in hard pieces. As the mud flakes off, fish scales or bird feathers will be removed at the same time. Pretty simple, huh!? Another way of baking meats is to wrap them in layers of wet leaves and place them on dirt-covered fire coals. Allow the meat to bake overnight and you'll have a tasty breakfast in the morning.

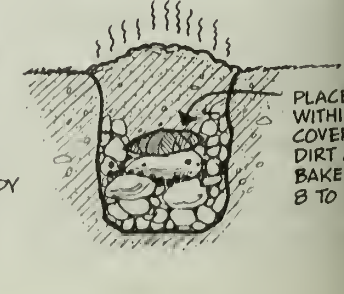
A more exotic and fascinating method of baking is to make a rock oven. This works especially well for seafoods of all types, but anything can be cooked in one. Dig a pit approximately two or three feet deep and line it with non-porous rocks—avoiding rocks located in or near drainages, streams, or standing water as they may explode if subjected to intense heat. Start a bonfire in the pit and place two 3-inch diameter green logs across the burning pit. Next, place a large rock on the green logs and wait for the fire to burn through the logs enough to allow the rock to fall into the fire. This signals the readiness of your oven. Rake out as many of the hot coals as possible. Don't worry if you can't get all the coals out, because it should be as hot as possible in the pit itself. Wrap the meat or plant life you want baked in large green leaves, aluminum foil, mud or grass, and place the bundle into the bottom of the fire pit. You can even use parachute material to wrap your foods, provided the exposed hot rocks and coals have been covered with a thin layer of dirt. This prevents the nylon material from melting and ruining your repast. Cover the entire pit with dirt, hot ashes, hot rocks, then sit back and relax. Your meal, depending upon the size of the food, should be done in eight to twelve hours. If you're not sure of how long to bake your food, just leave it in the pit for a full day and it will still be hot and juicy when you uncover it. If you've never taste food prepared in a rock oven, find a safe place and try it out —it sure impresses the neighb

We've talked about many d ferent ways of preparing food but really haven't even touched the surface. There are still ma other ways to prepare food in the wild, such as frying food o hot rocks, drying meats and p in the sun or in a smoke rack, or even baking in a wilderness reflector oven. As I mentione earlier, your imagination is th limit.

Sergeant Winston had a to time surviving and became we and scared because of his inal to prepare foods without the modern conveniences of a sto That doesn't have to happen to you, if you'll take just a small amount of time to prepare for possible future conflict with t wild. If you do it right, you car come home "fat and happy."







n hour late and a dollar short

Anonymous

erospace Safety solicits arti-
from aircrew who have a
to tell that is relevant and
d be of interest to fellow
ewmen. We'll print your
e or run it anonymously.
e let us know who you are,
ver, so we can contact you
essary.—ed.

he telephone rings at 0700. The command post con-
roller has called to advise
hat you overslept and missed
rst launch on your Super-
of Flying duty. The deputy
nander for operations is
ard the plane and your
ron commander covered
unch for you. The reason
mmand post controller did
ll you earlier is: *You for-*
pay your phone bill prior
ng TDY. After returning
TDY, you were issued a new
one number. Your squadron
ander *knows* your number
ve it to the command post
ller and does not want to
you until he cools down.)
lay starts. . . .

nmand Post Controller:
morning, Captain Sunshine.
u planning to come to
oday?"

tain Sunshine: "Oh, wow!
ime is it?"

troller: "The little hand
even and the big hand is
twelve."

tain Sunshine: "Don't tell
lept through another tour!"

nmand Post Controller:
let me put it this way.
en't exactly five minutes
The D.O. would like to
you when he lands and
quadron commander said
not care to talk to you.
n pick up the brick at
adron building. Have a
ay."

Captain Sunshine: "Thanks!"

After muttering a few words of profanity, Captain Sunshine gets dressed and reports for duty.

Captain Sunshine: "Good morning, boss. I guess I did it again, didn't I?"

Squadron Commander: "You sure did, Captain Sunshine! What was the problem this time?"

Captain Sunshine: "Well, uh. . . ."

Squadron Commander: "Never mind, Sunshine. I don't even want to hear it. You can save it for the D.O."

Captain Sunshine: "Uh, yes, sir. I guess I better get to work now."

Squadron Commander: "Just a minute, Sunshine. Most of the time, you do a fine job. You fly a good airplane and seem to be interested in your job. Lately, however, you've missed several scheduled activities. Why? Do you want me to float you a loan for a new alarm clock?"

Captain Sunshine: "Well, sir, I know there's no excuse for my tardiness. All I can say is that I'll do better."

Squadron Commander: "The D.O. will probably want to hear more than that. He lands at 1300. Pick me up at 1245 and I'll go with you to see him."

Captain Sunshine: "Yes, sir. I'll be by at 1245."

After talking with your squadron commander, you think long and hard about ways to keep the same thing from happening again. You realize that you're the world's worst procrastinator. This could be your whole problem. Your philosophy of "Never do today what you can put off until tomorrow" has finally caught up with you. You tell yourself: "Self, I'm going to make a conscientious effort to change. I'm going to complete all those things that I'm supposed to prior to the suspense. Instead of floating with the current, I'm going to paddle downstream! If you "stick to your guns" and follow this plan through, you will probably not have any other problems.

Thinking to yourself, you realize the time is 1240. *Wasn't I supposed to do something? That's right, pick up the squadron commander!* How many times has your squadron commander told you: "If you can't be on time, be five minutes early." At 1245, the squadron commander is waiting outside the front door of the squadron building. You pick him up and get back to the flight-line in time to monitor the D.O.'s final landing. After landing, the D.O. comes over to the S.O.F. vehicle.

D.O.: "Oh, hello Captain Sunshine. Did you get enough sleep last night?"

Captain Sunshine: "Uh, yes, sir. Sorry about dropping the ball this morning."

D.O.: "Well, Sunshine, let me relay a story that an old commander once told me. He asked me if I knew the difference between players and professionals. I gave him what I thought was a fair answer. He said, 'Players go to the game and they play and perform. Professionals, on the other hand, play, perform, and are interested in the results of the game as well.' And Sunshine, we need professionals on our team."

Captain Sunshine: "Yes, sir."

D.O.: "And Sunshine, remember the five P's. Prior Planning Prevents Poor Performance. A word to the wise is sufficient."

Captain Sunshine: "Yes, sir. I'll do better!"

The previous story is true. The names have been changed to protect the guilty. ★

LIGHTNING AND AIRCRAFT

continued from page 4

CAN YOUR AIRCRAFT TRIGGER A STRIKE?

A question often asked is, "If an aircraft cannot produce its own lightning flash, can it trigger a natural one?" Stated another way the question might be, "Would the lightning flash have occurred if the aircraft were not present?"

While there is still much we don't understand about lightning formation process, most researchers conclude: (1) that aircraft are usually struck by flashes that would have occurred anyway, but (2) the aircraft, being conductive, is attractive to a nearby leader and causes it to divert towards the aircraft rather than continue on in some other direction. There is some evidence that jumbo-jets sufficiently "squeeze" and intensify the electric field around a nearby charge center to cause a stepped leader to form before it otherwise would have, thus triggering a strike; but this seems improbable for smaller aircraft.

WHEN IS A STRIKE MOST LIKELY?

Erratic as they are, it is impossible to predict just when or where a lightning strike will occur, but some idea of when to be on the alert for one can be obtained from study of past experience.

Figure 5 shows flight and weather conditions summarized in a recent survey of 200 commercial airline strike reports, and Figure 6 shows the flight altitudes at which most of these aircraft were struck. The outside air temperature reported in most instances was within a few degrees of the freezing point (0°C). From this data one might draw the conclusion that a strike is most probable to an aircraft flying at an altitude between 10,000 and 15,000 feet, within a cloud, experiencing rain and light turbulence and with the outside air temperature near 0°C. Strikes have been reported under many other combinations of circumstances, however.

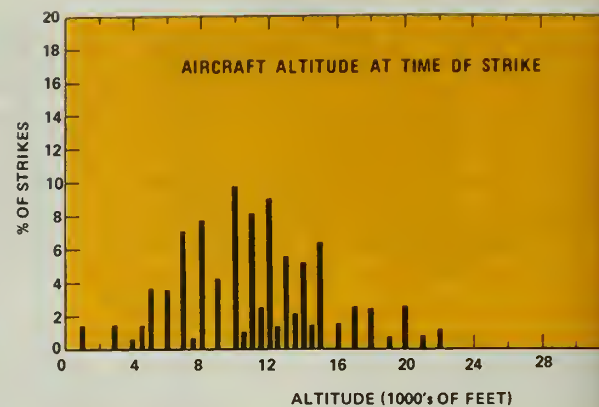


FIG. 6 Altitude Where Most Strikes Occur

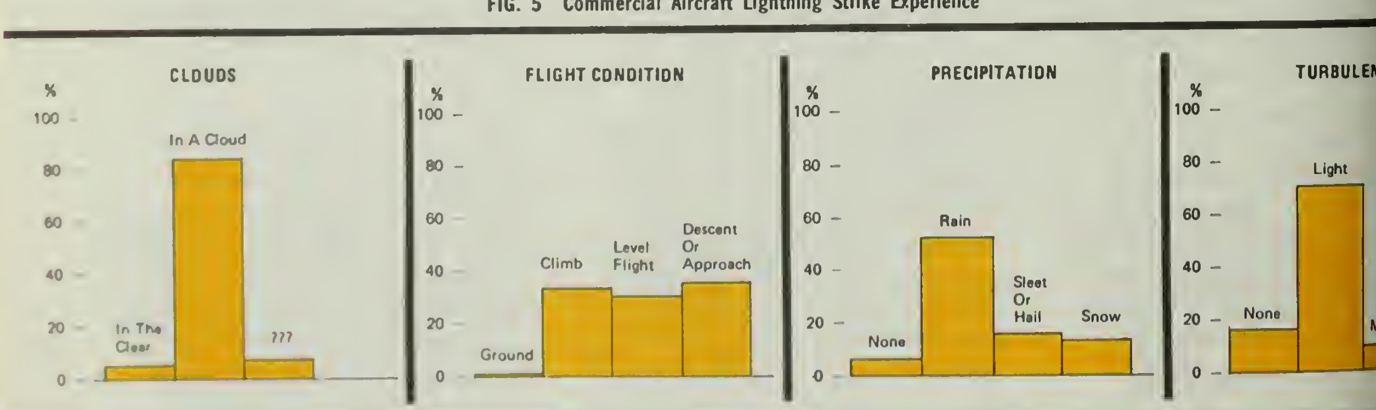
WHAT ABOUT AVOIDANCE?

Good flying practice and USAF flight manual for avoiding thunderstorms at all cost—not on avoid lightning strikes but also to avoid the other ifestations of a good thunderstorm: turbulence, ha rain. Careful study of weather reports and use of can help you avoid areas of precipitation, but you can circumnavigate these by well over 25 an occasional strike may still reach out to greet There are many reports of strikes occurring to ai operating between clouds or in other areas whe thunderstorms were forecast, and a few pilots even reported "bolts from the blue." Thus, even i fly diligently by the book, you can probably exp be "zapped" sometime during your flying career

WHAT EFFECTS CAN YOU EXPECT?

As we said before, electric currents of up to 20 amperes will flow through your aircraft between ning entry and exit points when you are struck. to its short duration, most of this current will r in the skins, with relatively little of it diffusing in terior spars and ribs. Fortunately, aluminum is good electrical conductor and there is enough o most aircraft to conduct this current.

FIG. 5 Commercial Aircraft Lightning Strike Experience



ost cases the only noticeable effect of this cur-
ving passed through your aircraft will be small
rks where the lightning flash momentarily at-
as shown in Figure 7. At trailing edges or other
where the flash can hang on longer, a hole might
ed. Holes can be prevented by making the skin
hough (0.080 inches will usually suffice) but
at thick are heavy and are usually used only
el tanks or other critical places where penetra-
he hot arc cannot be permitted.

ning may do a lot more damage to nonmetallic
es such as the fiberglass radome shown in Fig-
n this case, a streamer induced from the radar
bably punctured the radome wall and reached
roaching leader. Then when the return stroke
this path, its explosive blast pressure shattered
me. The radome contained the blast until its
had built to a very high level, resulting in a
explosion," forcing the crew to eject.

e is a pitot probe on the radome, as is the case
fighters, the probe forms a good lightning rod.
the pitot probe is grounded to the airframe by
nside the radome. Sometimes these ground
e too thin to carry severe lightning currents
exploded on several occasions, with damage
o that of Figure 8. Sometimes the aluminum
ich bring pitot static pressure back to the in-
s have acted as the ground conductor, but the
nagnetic fields surrounding lightning currents
mp such tubes, cutting off instrument air. To
tters even worse, the cord which brings elec-
r out to the probe heater is also susceptible
ghtning magnetic fields. These fields may in-
ere surge voltages in the heater power circuit.
heater is usually powered from the essential
r equipment powered from this source is ex-
the same surge. The immediate result has been
o a variety of other electronic equipment, and
n a few cases, to loss of the entire aircraft.
shows typical lightning damage to pitot static
a heater power cord. Much more is known to-
t how to protect against these effects, so that
and pitot systems in the aircraft now being
not likely to be as vulnerable.

e they are usually located on wing tips or
remities, navigation lights are frequently
ormally, the flash attaches to the metal lamp
nd does little damage, but once in awhile it
the globe and light bulb, as happened to the

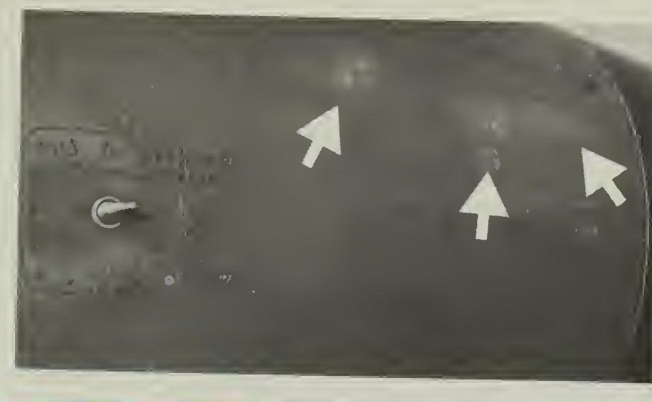


FIG. 7 Pit marks where flash attached

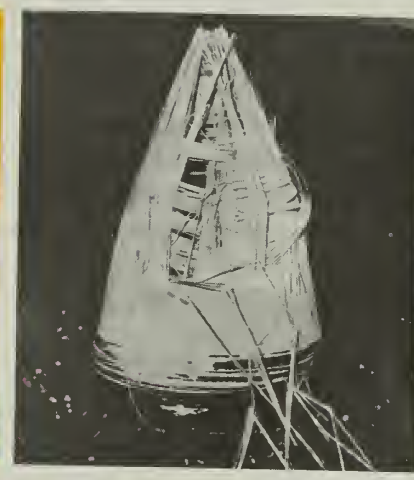


FIG. 8 Radome shattered by glass effect

FIG. 9 Typical lightning damage to pitot static lines and heater power cord

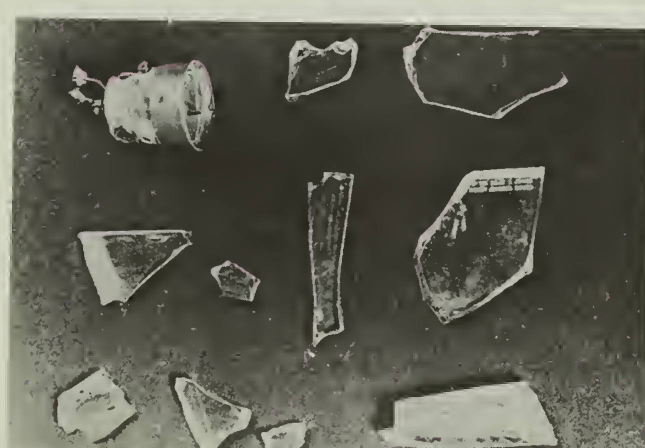


FIG. 10 NAV light globe broken by lightning, leaving a path for lightning current to enter aircraft's electric system.

LIGHTNING AND AIRCRAFT

continued

lamp in Figure 10. If this occurs, a portion of the lightning current may get into your aircraft's electric power distribution system and damage electronic equipment powered from the same bus. This, like the pitot heater situation above, is another of the more hazardous lightning effects for it may cause loss of instruments or communication equipment you rely on in bad weather. The circuit breakers for this equipment will usually pop, but not before the lightning surge has already passed through and done whatever damage it can. Surge arrestors are available to suppress these surges before they get this far, but they are not found on all aircraft. If this happens to you and some circuit breakers pop, try to reset them, but be aware that some equipment may be permanently damaged.

FUEL SYSTEMS

The vapor over a partially filled tank of JP-4 can be explosive at the flight altitudes and temperatures where lightning strikes most frequently occur, as indicated by the flammability limits of a JP-4/air mixture shown in Figure 11. The overpressure which such a

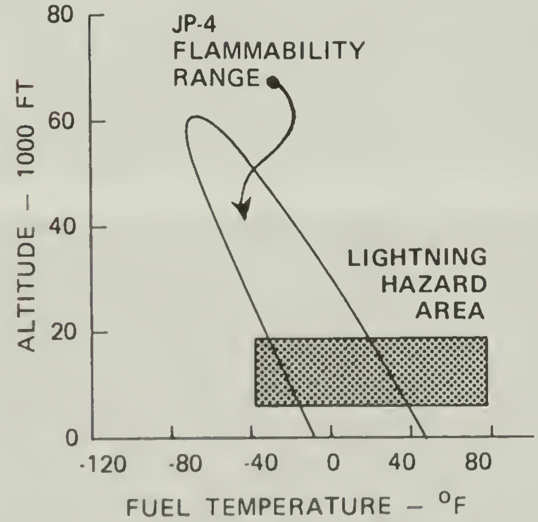


FIG. 11 JP-4 flammability range.

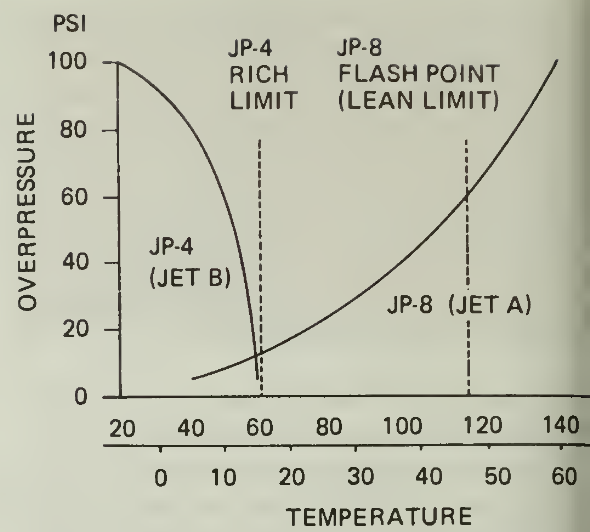


FIG. 12 Pressures generated on ignition of partially fitted fuel under sloshing conditions.

mixture can produce when ignited is shown in F 12, and these figures show that the maximum de of flammability and overpressure occur near the altitudes and temperatures at which most ligh strikes to aircraft are reported to occur.

There have been many laboratory studies ma the ways a lightning flash might produce a sour ignition within an aircraft fuel tank. Flashes atta to access doors and filler caps have been fou cause sparking across inadequate joints or bonds flashes attaching to the surface of an integral tank have been shown capable of burning a hole if mitted to dwell long enough at one place or if th is too thin. Also, simulated lightning flashes have shown to be capable of igniting vapors at fuel ven lets under certain airflow conditions—condition almost certainly would not exist in flight. Prot measures for each of these situations have been oped, however, and incorporated into today's ai so that the probability of fuel ignition from a ligh strike is remote.

Since the causes of some in-flight fuel tank sions have never been found, there may still be ning-related ignition mechanisms which are not understood. This is another reason why thunder areas should be avoided, and why operations inv the fuel system, such as in-flight refueling or du of fuel, should be avoided while flying in cond where lightning strikes may occur.

INDIRECT EFFECTS

The lightning effects discussed thus far are fre ly termed the *direct effects* because they involve

f physical damage. In recent years it has become ent that there are other *indirect effects* produced htning strikes. Flight and engine instruments and electronics have occasionally malfunctioned even h no direct connection with any part of the light- lash existed. Because electronic systems are being singly depended on to perform critical functions litary and commercial aircraft, the Air Force Dynamics Laboratory (AFFDL), National Aero- s and Space Administration (NASA), and some manufacturers have initiated research programs l out more about these indirect effects. Thus far, been learned that the electromagnetic fields accompany lightning stroke currents may find ay inside an aircraft, where they induce transient es and currents in the aircraft's electrical wiring. ccurs even if the aircraft is all metallic, because are still a lot of nonmetallic windows through these fields may enter, and the fields themselves very intense. This summer, AFFDL, working in ction with NASA, will fly an instrumented Lear craft near thunderclouds in Florida, in an at- to record and measure the electrical transients nearby lightning flashes induce on several elec- ircuits in the aircraft.

se data will further our understanding of indirect and help validate test techniques that are pres- n use to study induced voltages in aircraft in the ory.

' ABOUT YOU?

most hazardous effect you are likely to receive lightning strike to your aircraft is temporary ss from the bright flash, if the strike occurs near kpit. This blindness usually (but not always) at night and may persist for up to 30 seconds, which time you may not be able to read your in- its. If you have a copilot, one of you may mini- is problem by keeping your eyes lowered when nk a lightning strike is imminent. Turning up strument lights may help by reducing your eye ty before the flash occurs and making the in- ts easier to regain afterwards. Keeping one eye s another technique.

pilots also report receiving a mild electric hen lightning strikes occur. Since you are in- conducting enclosure, the electric potentials of ng around you remain very nearly the same pect to one another—even during the lightning and you are not in danger of being electrocut- strong electric fields which can pass through the windows as the leader approaches, however, may give rise to streamers from your head or shoulders, causing a slight shock as the minute currents which feed these streamers pass through your body. Just as often though, the shock is simply your startled reaction to the loud bang accompanying the strike.

The effects on you may be much more serious, however, if you are flying in a nonmetallic airplane, such as a glider. In such a craft, the control cables may be the only electric conductors and place you in a direct path between attachment points, with fatal consequences.

PRECIPITATION STATIC

Our discussion thus far has dealt with lightning strikes. Another electrical phenomenon which may be even more annoying is precipitation static, more commonly called "P-static." When an aircraft is flying through rain, sleet, hail, or snow, the impact of these particles on the aircraft will cause a charge to separate from the particle and join the aircraft, leaving the aircraft with a preponderance of positive or negative charge (depending on the form of precipitation) and thereby elevating its potential with respect to its surroundings. Since the aircraft has room for only a small amount of this charge, some of it will begin to leak off in the form of ionization at sharp extremities. This ionization continues as long as the aircraft is flying in P-static charging conditions (precipitation) and is visible as a bluish corona (St. Elmo's fire) at night. Unfortunately, this ionization radiates broadband electromagnetic radiation (EMR) throughout the low and high frequency radio bands. This EMR is often received as interference, or "static" by the aircraft communications or low-frequency automatic direction finding (LF-ADF) or communication receivers, and may render this equipment temporarily unusable. The static dischargers usually found on tips and trailing edges reduce this interference by making it easier for the charge to leave the aircraft, but they are not always 100 percent effective, especially in heavy precipitation. Since the conditions that produce P-static may also produce lightning, a strike should be considered possible when P-static appears, but except for providing an easily replaceable attachment point, the static dischargers provide little protection against lightning strikes.

LIGHTNING AND AIRCRAFT

continued

We have reviewed the conditions where lightning is most prevalent and discussed some of the more common things to expect when you are struck. There are new structural materials and electronic devices becoming available whose susceptibility to lightning effects is not known, and there are still aspects of lightning itself which we do not fully understand. Therefore, a considerable amount of research is under way at present to learn more about lightning and its effects, and how to design even better protection into new aircraft.

To date relatively few serious incidents or accidents can be attributed to lightning, but there are two trends in aircraft design which promise to aggravate the problem unless positive protective measures are utilized. The first of these is the increasing use of miniaturized, solid-state components in aircraft electronics and electric power control systems. These devices are more efficient, lighter in weight and far more functionally powerful than their vacuum tube or electromechanical predecessors, but they operate at much lower voltage levels and thus are inherently more sensitive to overvoltage transients such as those induced by lightning.

The other trend is toward the use of nonmetallic materials in place of aluminum in skins and structures. This reduces the amount of electromagnetic shielding which the airframe provides and increases the exposure of wiring to electromagnetic fields. Nonmetallic materials may also aggravate some of the other effects noted earlier. Streamers may be drawn from conducting objects inside plastic wing tips or radomes, for example, puncturing them on their way out to meet an oncoming leader. The stroke current may then do extensive damage to the plastic sections. Fortunately, most manufacturers recognize this problem and provide *diverter* strips to minimize punctures of plastic extremities which enclose vulnerable items such as fuel cells or electrical wiring. Together, these two trends present a challenge to the designer of lightning protection for aircraft of the future, but the challenge can be successfully met if it is recognized early in design.

FIG. 13 Simulated lightning tests on wing-tip fuel tank at High Voltage Laboratory, Pittsfield, Massachusetts.

Usually, the vulnerability of new materials or to lightning, and the adequacy of protection syst determined by subjecting them to simulated li strikes in a laboratory. The Air Force Flight Dy Laboratory has recently installed a lightning sim facility for this purpose, as have some of the manufacturers. Others utilize facilities such as High Voltage Laboratory pictured in Figure 1 GE Lab was originally built to help design li protection for electric power systems, but mucl equipment is applicable to aircraft testing as we

Much is being learned in the laboratory, b progress there is only as good as our ability to si the real-life environment. Thus, we continuall reports from you who experience the real th flight—reports especially of incidents that see usual for some reason, or ones that cause a m tion of some piece of equipment. You can help viding complete information on these incidents Air Force Inspection and Safety Center. Those importance are the ones involving electrical o tronic equipment malfunctions. Describe the m tion as you experienced it and try to follow u maintenance and repair personnel to see if you c out what exactly burned out or malfunctioned. graphs of unusual damage will also be helpful retention of damaged parts for further inspecti course, many lightning strikes are "routine" and need not be elaborated upon except as re in AFR 127-4. But the extra time you take to the unusual ones will help designers provide lightning protection in the future. ★

NEWS FOR CREWS

mation and tips to help your career from the folks at Air Force Military Personnel Center, Randolph AFB, TX.

LT COL HENRY VICCELLIO, JR.
Chief, Rated Officer Career Management Branch • Air Force Military Personnel Center

IMPRESSIONS

ine my surprise when the Colonels' Group re-y called me with an assignment notification directly reflected my AF Form 90 desires: wanted a job in personnel for some time, I accepted, and began preparation for the in emphasis from the day-to-day operational of a wing ADO.

a few weeks in this job, several strong im-ns seem more than worthy of mention. The the widespread misunderstanding of current el management policies and systems that n the field. Upon arrival, I found myself total-e dark on the basic concepts of rated officer ment, along with such key career manage-ctors as weapon system identity, fair-share and the Rated Supplement. In the field, as-its flowed down to us at the unit level with rresponding logic as to the "why" of each nd how it fits into a career pattern. As a wing or, I had been groping without fully realiz-career counseling without any real knowledge ubject matter myself. Several important dan-e inherent in this situation. The supervisor erform his tasks in the personnel arena, and sult it could lead to misunderstanding his So the first big impression I have is of the lming need for education—everyone involved understand both the plan and the system effect it. We're taking some positive steps to at more of a reality.

ond impression is of the potential that exists ly personal approach to career management. ound the establishment and utilization of system identity, the rated resource manage-stem was designed by and is operated by ficers—guys who have been qualified in aft they are manning and who have shared riences of those individuals whose assign-nd careers they manage. Sensitivity, credi-st-hand knowledge of the requirement, and jectivity where it's called for—all are natural from this arrangement.

After two years at Wing level, I was truly staggered to discover the wide variety of job opportunities available to the individual rated officer, regardless of his rated background. Each of the ten weapon system worlds we use for management has training, crew force, and unit-level staff jobs in large quantities, and every rated officer is familiar with these. But I was amazed to discover that these represented only one-half to two-thirds of the total positions requiring rated officers, all of which offer opportunity and challenge to the right guy at the right time. A few include:

- Instructor duty at the RTU/CCTS level.
- Special-mission flying units like FACs, aggressors, Tactical and Strategic Reconnaissance, Wild Weasel, Special Air missions, Flight Test Units, etc.
- ATC/IP duty.
- MAAG/Attache duty worldwide, including many cockpit jobs.
- Staff duty including high-visibility jobs at the Air Staff/OSD level, NATO jobs, jobs with other services, etc.
- Exchange duty worldwide.
- Instructor jobs at AU, ROTC detachments, and the AFA.
- Supplement duty in any one of 44 support fields that can put your exotic academic background (or just plain common sense) to management tests beyond what you'll find in the average flying squadron!

The Rated Supplement suffers from its position as probably the most maligned and misunderstood personnel program we have. Designed as our quick-reaction pool of ready rated assets in case of a contingency, it provides a real broadening opportunity to young, rated officers with current flying experience. Like most guys, I had totally incorrect impressions formed by third-hand stories about people "dumped" in the Supplement—few of which I now find to contain any truth. The Supplement image is one misconception I intend to clear up right off the bat. We'll be increasing the publicity on just what the

NEWS FOR CREWS

continued

Supplement is, why we have it, and what type of officer makes it a reality in terms of both a contingency asset and a career enhancement.

A final impression, and one that goes hand-in-hand with all the others, is the real opportunity the system offers each of you to participate in the career management process—and the widespread misconception of that fact! While Air Force requirements are the bottom line in assignment policies, personal desires are given more weight than I had imagined possible. The sad state of Form 90s in general, however, makes it difficult to achieve the level of personal involvement both we and you would like to see. My career managers simply don't have time to call every individual about every assignment or opportunity. You have got to let us know the whole story. Part of the problem lies in our court. We're taking strong initiatives to get the word out to the field on how your career fits into a bigger picture, with details on many of the career opportunities I mentioned above. However, until such time as we have the problem solved institutionally—and that may be a while—every rated officer should take the following actions:

- Research current personnel directives to determine career progression guidance and job opportunities corresponding to your grade and experience.
- Contact your career manager and discuss the pros and cons of various assignment options. Remember the primacy of Air Force requirements.
- Fill out a Form 90 to include several additional assignments in which you have interest beyond your first three choices. Include Supplement career fields and any special duty interests. Nothing is more difficult than making an assignment in the blind, and your Form 90 is the key to our meeting your desires. Keep it up-to-date!
- Maximize your self-improvement efforts commensurate with your interest and time available. A lack of civilian education or PME can severely limit what you're eligible or acceptable fo[r in] the way of interesting jobs—it's hard to [see] you as a "comer" if you haven't shown inte[rest] in yourself!

In essence, today's career management sy[stem] provides you with a functionally qualified equiva[lent] of yourself—another pilot or navigator with si[milar] experiences—to plan, execute, and develop you[r ca]reer in concert with Air Force requirements. Reg[ard]less of what assignment you may get, where yo[u go,] or what you do, that individual—the resource m[ana]ger—always has a strong input to the final [deci]sions. He helps you build your rated credentials, [pro]tects your operational viability, monitors your ca[reer] progression, and gives weight to your persona[l in]terests. To ensure that each rated officer gets e[qual] opportunity for career-enhancing opportunites, [we] conduct an annual review of all rated officers eli[gible] for PCS; it gives you visibility, and helps us pic[k the] best man or woman for the job. We feel the sy[stem] works better than it ever has before—to mee[t Air] Force requirements with full consideration of [your] career needs. While we're receiving some feed[back] from the field that "no one cares" above squa[dron] level, I can assure you that's dead wrong! Don't [for]get, it's a two-way channel for communication—[give] us a call, establish the dialogue, and I think y[ou'll] agree with my overall impression—the rated [officer] management system works! ★

ABOUT THE AUTHOR

Lieutenant Colonel Viccellio is a graduate [of] the USAFA. He is an 0-6 select whose prior a[s]signments have included tours of duty on th[e] Air Staff and as an F-4 squadron commande[r.] He assumed his current position in Decemb[er] 1977.

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MAJOR **CAPTAIN**

Robert L. Merrill George Macken, III

Detachment 2, 1400th Military Airlift Squadron (MAC)

Randolph Air Force Base, Texas

On 10 June 1977 Major Merrill, aircraft commander, and Captain Macken, copilot, were on a local T-39 training mission when the master caution light illuminated along with the DC generator off light. Major Merrill checked the loadmeters and noted a zero reading for the left generator and 1.5 for the right generator. Following checklist procedures, the generators were alternately turned off, reset, and then on. No circuit breakers had popped. The left generator could not be reset, and the right generator could not be returned to normal operating limits. Preparations for a battery-only return to Randolph AFB were begun. The cabin was filling with dense smoke which continued to increase in intensity with the possibility of an aft fuselage fire, since the source of the smoke was coming from the aft circuit breakers and load equalizer circuit area. Without the benefit of navigational aids and with partial obscuration of the ground by a low stratus deck, they started a VFR letdown. Since the smoke continued to increase, the crew decided to make an emergency landing at Kimble County Airport, Junction, Texas. One pass was made over the field to determine wind direction and speed, runway condition, and safest landing direction. On downwind, the gear was lowered using the landing gear emergency lowering checklist. The electrical master switch was momentarily turned on to lower the flaps, extend the speed brake, check for a safe gear indication, obtain fuel quantity readings, and trim the aircraft for a minimum run landing configuration. On short final, the electrical master switch was again turned on to provide hydraulic pressure for braking and electrical power to raise the flaps following touchdown. The aircraft touched down 300 feet from the threshold and stopped 1,800 feet down the runway with no tire damage. The professionalism, skill, and courage displayed by Major Merrill and Captain Macken in the face of a critical inflight emergency probably saved a valuable aircraft. WELL DONE! ★


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Volume 34

FOD

ne never ending war on our old enemy FOD, the best defense good offense. For a closer look at what an active and aggressive program can do, take a moment to read this article. You may a few interesting ideas that can be adapted to your base.

NEL ROBERT S. BEALE • 4th Tactical Fighter Wing • Seymour Johnson AFB NC

re can be no doubt that the tential for FOD is greatest in e Periodic/Phase hangar. the single most important nply because the aircraft is up. Having said that, con- ution, good procedures and control can all be nullified 'EAK LINK" in the system. be 100 percent on the ramp he hangar, but if an aircrew checklist on the instrument "last chance" drops a pin, phone cord, a hat or even a d area badge, it was all for This is first and second ech- D prevention, i.e., the indi- who dropped the FOD (the R) and the guy who didn't up.

's nothing new here, this is all old stuff.

We have adopted an interesting third echelon FOD program at Seymour Johnson AFB that you might consider for your own Air Patch. It's called Airfield FOD Trend analysis.

Before discussing this last ditch effort, let's consider certain basics that should be obvious. Do you have an adequate airfield sweeping program? Does it include the runway (often)? Do you include the street sweeper in the plan to keep rocks and junk off the flight line access roads? Do you limit the number of access roads to the minimum necessary? Do you follow up on these procedures? Do you track the status of your airfield sweeping equipment? Do you use your electromagnet? One base installed permanent magnets on the front bumper of the line trucks with excellent results.

The BIG Wayne-Vac Sweeper is an excellent piece of equipment if used properly. The vacuum hood must continually be adjusted, however, or it will not pick up a small bolt off the runway.

WHERE DO YOU LOOK FOR FOD?

We use our big electromagnet on the runway every weekend. The operator must be carefully briefed. Ours will not pick up a large bolt at more than 5 mph. CAUTION: When the magnet engine runs out of gas, all the FOD drops on the ramp. Can the driver hear the engine quit? If he is driving a dump truck, he probably can't. Give him a mower

Seymour Johnson's electro-magnet has prevented many FOD incidents.

Seymour Johnson AFB Airfield Management Chief, Major Thomas A. Dwelle, discusses FOD Trend Analysis with FOD committee members Captain Lyle Samuels (center) and Technical Sergeant Glen Whitwell, and Captain David A. Parisot, Ninth Air Force/LG FOD inspection team chief. In a monthly FOD pick-up, the debris shown in the foreground was found adjacent to the runway, and that in the rear was found elsewhere on the airfield.

FOD continued

tractor, if weather permits. We used to find large metal objects within 20 feet of the arresting cable. Investigation revealed that our Wayne-Vac Sweeper will not pick up a 3-inch bolt, but will scrape it along the runway. This was obvious from the scrape marks on the bolt. When the driver lifted the vacuum hood to get across the arresting cable, the metal was deposited next to the cable. Look carefully at what you find on the runway. Every piece will tell you a story.

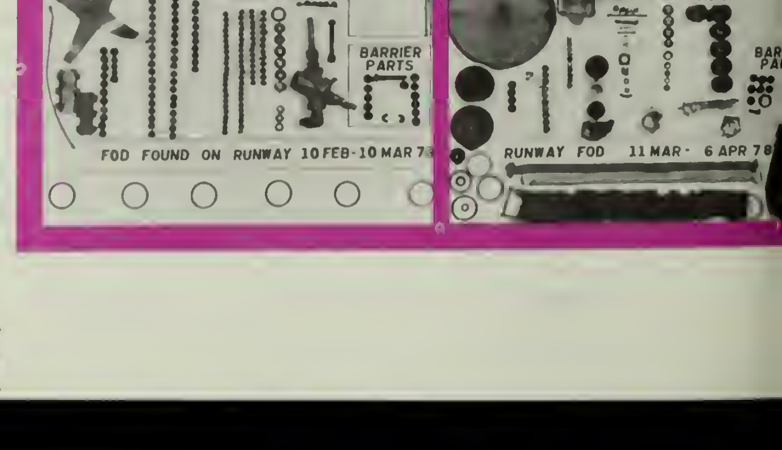
WHO COMES TO THE FOD MEETING?

Who comes to your FOD meetings? Do you know? How many are primary members? (The ones who really should be there.) How many are alternates? How many are guests? Try a show of hands at the next meeting. *The word gets around quickly!*

APPLIED TREND ANALYSIS

Having reviewed the basics, how can Trend Analysis help you locate that weak link? We generate great interest at our FOD meetings in an attempt to identify the pieces and chart some sort of trend. All items found on the airfield during the month between FOD meetings are laid out carefully and labeled as to where and when they were found. This started one week when the airfield manager discovered four bomb rack parts in five days on the taxiway and runway. The positions/dates were plotted and the chief of maintenance solved that probl a hurry. Failure to follow tech was the culprit. Six months elapsed and we have not foun more bomb rack parts. This is cal of our "TREND ANALY We discovered two F-4 pilot c from the drag chute, on the ru within a three-day period. Wh were investigating, a third on peared. The solution was s The parachute shop replaced nylon strap on all old drag c and the problem went away. dentally, a B-52 went directly one of these at high power s 1,500 feet into the takeoff ru did not ingest it into the engi take . . . very interesting. An example is bomb rack safety

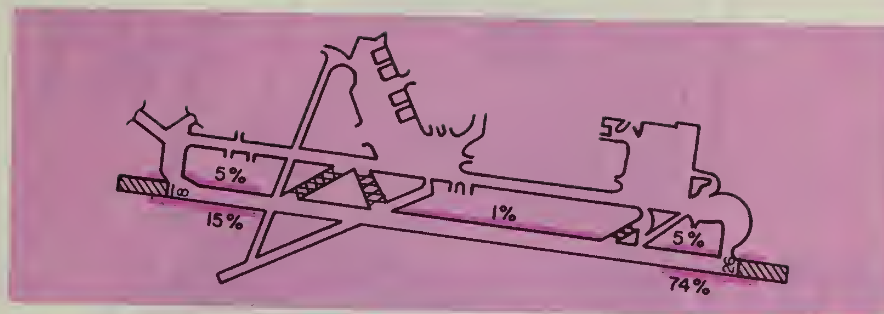
Monthly display boards of FOD deposits categorized by type helped identify major recurring sources. In some cases, this has been used to trace down maintenance errors and eliminate them, and alter operational practices which were causing added FOD.



t were found on the taxiway be-
een the de-arm area and the
np. We discovered that a man on
de-arm crew was putting the pin
the wrong hole. The opportuni-
for Trend Analysis are endless.
e key is to have one agency re-
nsible for checking everything.

n an attempt to analyze every-
ig that falls on the runway, we
lt a 4' x 10' box covered with
' wire mesh. We dump the vac-
n sweepings into this box and
arate the metal for analysis. All
al parts are mounted on 20" x
boards, shown in the picture,
display at the FOD meeting and
ne maintenance squadrons. Each
rd shows the metal recovered
n the runway since the last FOD
ting. The 11 March—6 April
lay is cluttered with panels, etc.,
n the SAC wing aircraft and
e F-105 drag chute parts, but
e is a drastic reduction of metal
s in each category. We proved
metal is falling off aircraft dur-
take off. It would seem that
er aircraft are most vulnerable
OD during a staggered forma-
departure. We avoid this by in-
ig on 1,000' spacing between
ents. This problem becomes
e on a narrow runway.

ne airfield manager is respon-
for FOD on the runway(s), all
ays and parking areas other
those that are restricted. All
found in this area by transient
barrier maintenance crew or
never, is turned in immediately
e airfield manager. If he can't
ify a piece, then he knows who
ll. Once a trend starts, e.g., a
ular type of fastener or safety
ound on successive days, then
hief of maintenance is advised
a memorandum for record
R) is written. An airfield map is
ned to the MFR for future long
trend analysis. This procedure
plicable to everything from pi-
om screws to drag chute parts.
ave stopped bad practices and
ed out problems in many areas.



Charting the locations of FOD picked up (shown in color) helps to set areas for future attention.

WHEN TO LOOK FOR FOD

We find that immediately after a rain is the best time to spot FOD on the runway. Our runway drains quickly because it is grooved; however, the small screws really stand out due to the sharp object/water contrast. A small screw can be spotted easily from as much as 20 yards. Walk or drive slowly . . . you'll be amazed. Finding FOD is an art that doesn't come easily. You must be attuned to constant vigilance. It must be like looking for other aircraft when you are flying. When you are out on the airfield and a dove flies by . . . chances are that you immediately start tracking it without thinking. We must have *this* sort of awareness in our FOD program.

I have harped on the runway, but there is a good reason. I believe that the potential for FOD is very high on the departure end of the runway. Most of the junk on the runway ends up on the departure end. It seems logical that when engines are run up and the heavy vibration starts, the loose objects fall off. To prove this, we put our big electromagnet on the edge of the runway, just barely onto the grass. We found six pounds of junk that came from the runway over the past 20 years: everything from gas caps (both aircraft and vehicle) to .50 calibre ammunition links.

That was surprising enough, but what startled everyone was where we found it. As you can see from the attached airfield diagram, we found 79 percent of the junk in the grass on the east end of the runway. The curious thing is that 74 percent of it was on the south side (of the east end). It turns out that Runway 26 is in use about 70 percent of the time. The junk that falls off gets blown to the side or out on the overrun. If it is *not* picked up immediately, the next time there is a runway change, the aircraft (especially the heavies with large wing span and podded engines), blow all this stuff into the grass as they turn off of the runway. Now we know where to look (departure end, opposite the turn off) and when to look (all the time, but especially when it's wet). And how to use Trend Analysis to trace FOD to its source. "CONCERN FOR FOD IS PICKING UP." ★

ABOUT THE AUTHOR

Colonel Beale got his wings in 1957 and has been flying fighters most of the time since. He has twice been assigned to the Air Force Flight Test Center at Edwards AFB, first as a student in the Aerospace Research Pilot School, and later as a test pilot and squadron commander. He flew more than 100 missions in the F-105 as a "Wild Weasel" during which he was awarded the Air Force Cross. He is currently Commander of the 4TFW, Seymour Johnson AFB, NC.

FLIERS--2; FIXERS--0!

CAPTAIN DAVID V. FROEHLICH • Directorate of Aerospace Safety

No, it isn't a game, and the last thing we want is someone keeping score! In the aircraft operations business, we tend to put fliers (aircrew members in general) and fixers (maintenance folks) on different sides of the fence. Perhaps there are some differences, but the goal is the same—a safely accomplished, successful mission! How do fliers and fixers communicate to accomplish that goal? Probably the main link in many cases is a thin booklet of forms called "the 781." When you consider that this is often the *only* crossfeed of data from the operator to the maintainer, it's really scary how little time or effort is expended on the aircraft forms. We are continually hounded with the need to log the time accurately and have our requirements properly documented. This is true, but only half the battle. POINT TO REMEMBER! The only way to ensure that the maintenance technician has an honest shot at fixing a problem is if someone:

1. Puts it in the forms.
2. Provides as much accurate detail as possible about the problem (in words maintainers understand. Don't assume they know how the system is used by the crew).

First, let's discuss whether to even put a write-up in the 781. I think your basic philosophy should be "if it doesn't seem right, write it up." This obviously includes the major items of inoperative equipment, warning lights, engine problems, etc. This is the stuff that aircrews always know to put in the forms. But! How about those flight controls that "just seem a little sluggish" or the flaps that "felt like they moved too slow" or the engine "that almost overtemped?" These are occurrences which are too often left out because the crew can't seem to put their finger on the cause. Let the experts find the cause; you just worry about giving them a complete and accurate description of the symptoms. If your "gremlin-type" write-up ends up as a CND (cannot duplicate) or an info write-up for the next crew, so what! We have still had it checked out *and* alerted the next crew to be on the lookout.

The other major problem is akin to when my wife drives the family wagon up to the mechanic ar "it goes whirr, click, thump!" write up the engine in your be machine as not sounding ri specific. Give the maintainer thing to work with, i.e., altitu speed, flight condition, G-l gross weight or whatever oth tors might help isolate the pr There's nothing that says yo print your name, rank, and extension, either. That info low the engine fixer or electri call you and discuss the prol they desire. Every little effor Remember the goal—safely plished successful missions.

So much for the general Now, down to the specifics o out the various parts of th Bear in mind that the form somewhat due to differen mands and aircraft systems r ments. The only things I v emphasize are some genera about each part in the forms

AFTO FORM 781 (Aircraft Data Record)

Over and over again! Log thing accurately. There are local handouts, samples, an ance available on the correc out of this page. Heed the The data on these pages goe lot of folks' computers and ates many statistics. Spend time ensuring the accuracy section.

AFTO FORM 781H (Aircraf Status and Maintenance Rec

This is the page that is used for the maintainers to the aircrew! Here is the curr tus of the machine, the s records, time computations, ment status, etc. There is a of info on "the H." Most of i ever, is in the form of c numbers which reflect discre which are explained in deta where in the forms. Airc spend some time cross-check symbols on the "H" with planation in the 781A or K.

y the bird is on a red diagonal or h. Check the time computations ensure that you're not taking a chine that's overdue an inspec- or some other time-compliance n. When you get a turn at a tran- it airpatch, check the servicing a and ensure the Thru-flight was omplished (if required).

'O FORM 781A (Maintenance crepancy/Work Record)

'robably the most abused form, is where the aircrew talks to the r. Be specific! The maintainer ild much rather see too much a than not enough. Granted, e is probably no need to include e columns of details about ything, but if there is some con- on that might shed light on a blem, include it!

'O FORM 781K AND J

hese forms are the only glimpse you can get into the history of machine. Again, time well- t! Read *and* understand the de- d discrepancies and TCTO's not plied with. It's embarrassing to -up an item or piece of equip- t only to get back and find that as already in the forms. Even e, I've seen a wasted sortie the crew jumped in a bird and ched, only to find that a piece uipment necessary for the mis- was written up as inop in the s. An extra minute of pre-flight ing would have saved the waste!

ne above is necessarily a very d-brush and non-specific cov- of the Forms 781. Why? n, because of the variety of mand and aircraft differences in orms, I can't cover all instruc- and problems. Tech order 00- contains the basic guidance, hat won't be enough unless the and Maintenance folks get to- r with a strong, localized pro- to make the aircraft forms in- viable communications tool. score of the game should be rs and Fixers—2, Mishaps ★

THE EJECTION STORY

MR. RUDOLPH C. DELGADO • Directorate of Aerospace Safety

In line with The Inspector General's continuing concern over the needless loss of life in aircraft mishaps and particularly the USAF ejection survival rate, which has been below 80 percent for 2 years, we plan to provide monthly updates of recent experience in this section. Late ejection decision usually accounts for more than half of all ejection fatalities. During the month of April, it again claimed two lives. Try as we may to find a cure for this problem, it has been, and is likely to remain, a matter of how well the individual is mentally prepared to eject. When an instantaneous egress decision is required, the more forethought, the more likely one is to survive.

So far in 1978, USAF egress systems have saved 19 of the 20 individuals who initiated them in-the-envelope. The sole failure is still under investigation, but other material impacting the seat while it was in the aircraft appears to be implicated. The message is clear. Egress equipment will save your life, if you give it a fair chance. ★

	Ejections	Fatalities	% Survived
1978 — 1st Qtr	17	4	76
April 1978	9	3	67

WEATHER FACTOR MISHAPS

MAJOR FRANCIS L. GUIBERSON
Air Weather Service
Scott AFB IL

RC-135A During an enroute descent at 4,100 ft MSL in moderate rain showers, aircraft was struck by lightning. Aircraft radar and approach control were not painting any thunderstorms at time of occurrence. All systems functioned normally after the lightning strike, and the aircraft landed without incident. Postflight inspection revealed two small holes in the radome on the copilot's side of the aircraft. A weakened area 4-inches in diameter around one of the holes required the radome to be replaced.

T-39A Since several rainshower buildups had been seen along the route of flight, avoidance techniques were used. When the aircraft arrived over the destination base, a radar controlled letdown in visual conditions was accomplished to remain clear of clouds. At 6 miles on PAR final approach, the aircraft entered a rainshower, experiencing heavy rain and turbulence; however, no lightning was noted. The aircraft flew out of the rainshower in visual conditions at 5½ miles from the runway and visually acc the field. One-half mile later, in visual cond there was a bright flash of light and a loud The landing was uneventful. The upper fibe antenna/beacon mount assembly on the vertica bilizer was destroyed with the aircraft skin no be separated from the vertical stab main spa upper three ribs. Appropriate avoidance proce were used.

RF-4C The aircraft was returning to home s at FL 240. Thunderstorm cells were noted miles to the East and 25 miles to the West. time of the incident, the aircraft was in cirrus c with no precipitation and no turbulence. The saw a bright flash and felt a jolt as the lig struck the nose of the aircraft. Damage was only to the fiberglass nose radome, knocking nation off.

C-130E During vectors by approach just pr turning on final for 25L, aircraft experienced

FIGURE 1
MISHAP CAUSES (1972-77)

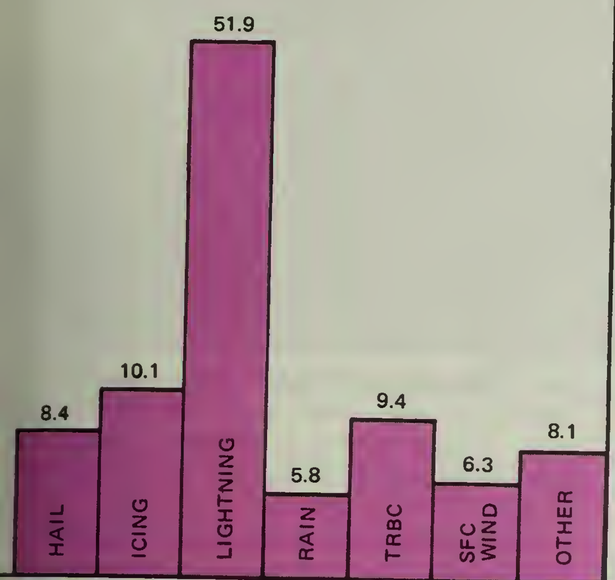


FIGURE 2
PERCENT OF MISHAPS BY AIRCRAFT TYPE
(1973-1977)

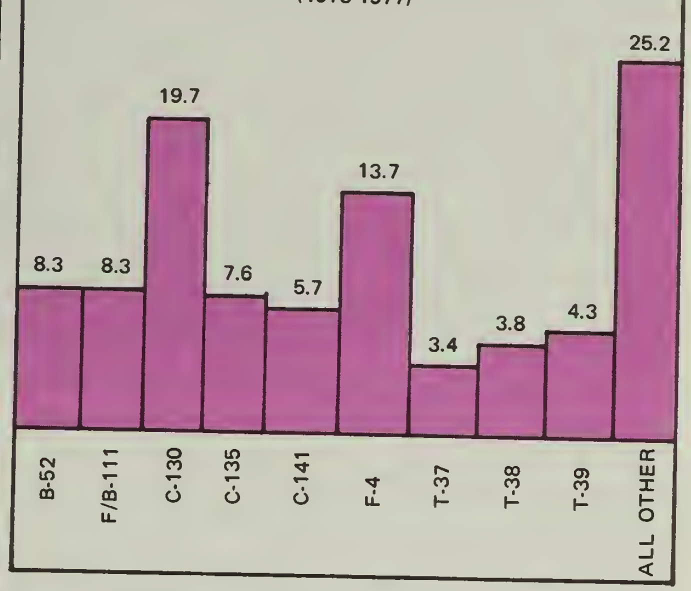


FIGURE 3
MISHAPS VERSUS SEVERE THUNDERSTORMS
BY SEASON

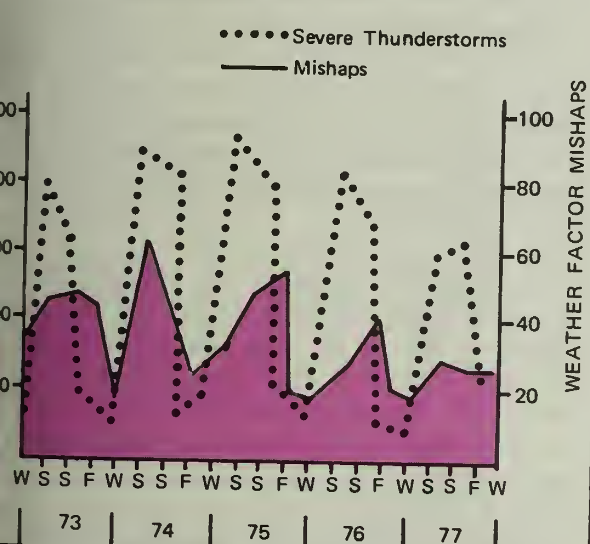
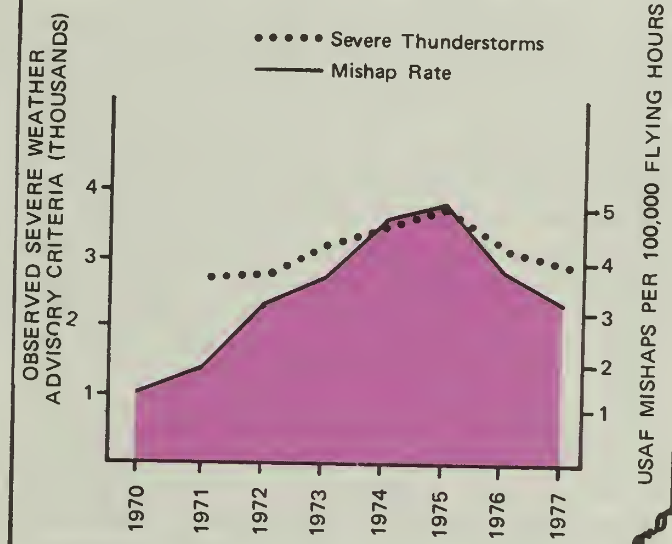


FIGURE 4
WEATHER FACTOR MISHAP RATE VERSUS
SEVERE THUNDERSTORM OCCURRENCE



strike. Aircraft was at 4,000 MSL with thunder- cells 6 miles shown on radar. Crew had not any previous lightning. The aircraft landed with- urther incident. Environmental factor, weather. aft landed and a ⅝" hole was found in radome.

e above incidents are reports of weather factor ps. A weather factor mishap is an aircraft ent or incident which has weather conditions contributing cause. As long as United States orce aircraft operate in all weather environ- , there will be accidents and incidents caused eather. By analyzing trends and patterns in weather factor mishaps, we can strive to identify the major causes and learn to avoid them.

For example, you may have noticed that each of the above incidents involved lightning strikes. This was not by mere chance. Although weather factor mishaps are caused by a variety of weather phenomena, lightning strikes are the most frequent cause. Figure 1 shows that they exceed all other factors combined. As you probably expected, phenomena usually associated with convective activity —thunderstorms—account for a large percentage of aircraft mishaps.

The vulnerability of aircraft to weather hazards depends on several factors, such as cruise altitude. Aircraft which normally operate near the freezing level are most vulnerable to airborne weather hazards. This is one reason the C-130 experiences more weather caused mishaps than any other aircraft. The percentage of mishaps for most United States Air Force aircraft is shown in Figure 2.

The effect of convective weather on flying safety is evident in the seasonal distribution of weather factor mishaps. Figure 3 depicts the trend of weather factor mishaps and severe thunderstorms in the CONUS since 1973. (A thunderstorm is classified as severe when accompanied by gusts of 50 knots or greater or three-fourths inch hail or larger at the ground. Meteorologists classify thunderstorm severity by the strength of the associated surface wind or size of the surface hail. These elements are easily measured and are good indicators of destructive potential.) The figure indicates that peak occurrence of weather factor mishaps during the spring and summer months coincides with the seasonal maximum of thunderstorms at most CONUS locations.

The long-term trend of weather factor mishaps also suggests a correlation with the occurrence of convective weather. Figure 4 shows the rate of weather factor mishaps versus the annual occurrence of severe thunderstorms in the CONUS. The graph shows that the weather factor mishap rate decreased significantly in 1976 and 1977 after a steady increase since 1970. Although we would like to attribute this decrease to safer aircraft operating procedures or improved weather forecasts, weather data indicates that it was possibly due to a decreased occurrence of thunderstorms in the CONUS.

If the news of a decrease in severe thunderstorms during the past 2 years gives you a new sense of security—you've probably been fooled by Mother Nature. The decrease is most likely a short term anomaly, not the beginning of a long term climatic change. Consequently, you can expect to encounter normal amounts of convective weather in the future. In fact, it is reasonable to expect a tendency for weather factor mishaps to increase as severe thunderstorms return to normal frequency. The following review of thunderstorm hazards and how to cope with them will help you minimize this potential threat.

THUNDERSTORM HAZARDS

Any pilot who has encountered thunderstorms knows that they are accompanied by numerous hazards. Hail, lightning, icing, extreme or severe turbulence, precipitation, and strong winds can be expected with each thunderstorm. Because of these hazards, all thunderstorms have the potent seriously damage aircraft which get too clo worse yet, penetrate the storm.

Lightning and electrostatic discharge are d hazards for pilots to cope with since they freq occur without warning. Lightning strikes m from cloud-to-cloud, cloud-to-ground, or clouds. The cloud-to-cloud variety occurs mo quently and is the most troublesome to aircra craft have been struck by lightning of this type as 25NM from the nearest thunderstorm. discharge is caused when a charge builds up skin of the aircraft and can occur in clouds, d haze. Lightning strikes and electrostatic dis occur most frequently at altitudes in which th perature is between +5°C and −5°C.

Hail is another frequent cause of aircraft da Hail is associated with the updraft which pro the storm, so it is usually located near the of a rapidly developing thunderstorm. But if t draft is strong enough, hail may be lifted to stream level and transported as far as 20 downwind in clear air. Hail usually occurs b 10,000 and 30,000 feet but has been encounte high as 45,000 feet. The greater the height of and intensity of precipitation the more likely c ing hail will occur. The only exception is in the and subtropics where thunderstorms are less to produce hail.

Turbulence associated with thunderstorm result in 2-4G gust loads on aircraft. Howeve loads as high as 6G have been measured in storms. Turbulence may be located anywhere the storm, including in the low level roll cloud leading edge. Light to moderate turbulence i encountered in the clear air around thunders Severe turbulence at middle and high altitu usually restricted to the immediate vicinity storm but can sometimes occur in anvil tops 30 miles downwind. Severe turbulence at low is most often associated with well develope fronts, at altitudes below 5,000 feet abo ground. The gust front associated with thunder is created by the downdraft hitting the grou spreading out in all directions. It is usuall intense ahead of the storm. Even moderate dov may produce an outflow of 50-60 knots at th of the storm. Rapid and unusually large char surface wind may result as far as 15-20 mile the storm. There is presently no operational re system to measure the low level wind shear ated with the gust front, so pilots should no

use of the possibility of hail, lightning, icing, turbulence, precipitation, and strong winds, thunderstorms have a potential to damage aircraft venture into or near the storm.

nunderstorm may be a hazard for landing and eoff operations even if the main cell is up to 20 es away.

hunderstorms contain considerable quantities of id water which is carried aloft by updraft. Liquid er may be encountered at altitudes much above freezing level. This water presents a hazard to raft since precipitation can seriously damage an raft moving at high speeds, in addition to causing ne flameout.

ince flight time through thunderstorm areas is ally short, the potential for icing is usually not as ous as the other hazards involved. However, in s of extensive thunderstorm coverage, icing will me a serious problem as exposure to icing con- ns is prolonged. The heaviest icing will usually r just above the freezing level, but severe icing super cooled water may occur in temperatures w as −25°C, and icing in temperatures as low -40°C.

MIZING THE RISK

asoned pilots know that the surest way to mini- the risk of thunderstorm damage is to avoid altogether. AFR 60-16 requires pilots to clear derstorms by at least 20NM at FL 230 and e and at least 10NM below FL 230. The first most important step in thunderstorm avoidance s with the weather briefing. The percentage underst orm coverage indicated on the DD175-1 ins to the specific route of flight, so always the forecasts for alternate routes or destina- If thunderstorms are expected locally, make it actice to check the radar before leaving the ner station. Also, if your departure is delayed by ur or more, get an update from the forecaster; te updates can be obtained via the pilot-to- service. Finally, routinely transmit PIREPs e benefit of the next crew along your route.

It is always a good policy to maintain a wide separation from thunderstorms, but if penetration is inevitable, the following steps will improve your chances of avoiding serious aircraft damage:

- First, call the nearest pilot-to-metro service with radar to check on the tops and intensity of the storm.
- Second, spend as little time as possible near the freezing level...
- Activate anti-icing systems before penetration.
- Reduce airspeed to diminish static buildup and stress loading on the airframe.
- If your aircraft is equipped with weather radar, select a path with the minimum gradient of echo intensity.
- If you're flying between two cells, you must be able to clear each cell by the minimum clear- ance distance, so cells at FL 230 and above must be at least 40NM apart.
- Overfly tops only if absolutely necessary. Allow a minimum vertical clearance of 5,000 feet. Increase the vertical separation by an additional 1,000 feet for every 10 knot increase in wind speed over 50 knots.

SUMMARY

The airborne hazards which accompany thunder- storms will probably continue to be a serious safety problem for the foreseeable future. However, air- craft damage can be minimized by identifying haz- ards and by fully exploiting available meteorological services. Pilot awareness and cooperative efforts of aircrews and forecasters are the keys to preventing an increase in the rate of weather factor mishaps in the future. ★

FORMATION FOLLIE

CAPTAIN JERRY E. WALKER • 86 FTS • Laughlin AFB TX

While on your trek through pilot training how often did your instructor beat you over the head for passing underneath lead during a formation crossunder? As an instructor, I am constantly screaming at some unfortunate student for not getting nose to tail clearance prior to crossing under. If the student questioned the necessity for clearance, I would simply fall back to the old expediency, "the book says so."

Of course, you also add the euphemism, "You could hit lead." While spouting this party line you know that Stanley Student is saying, "Of course you could hit lead. You could hit lead from any position in formation. Only an ignorant fool would hit lead." Stanley is absolutely right. Only an IGNORANT fool would hit lead.

A quick look at some elementary aerodynamics can eliminate the ignorance and leave the midairs to fools. According to NAVWEPS 00-80T-80, *Aerodynamics for Naval Aviators:* ". . . Another important form of direct interference is common when the two airplanes are in a trail position and stepped down. As shown in Figure 6.10 (right), the single airplane in flight develops upwash ahead of the wing and downwash behind and any restriction accorded the flow can alter the distribution and magnitude of the upwash and downwash. When the trailing airplane is in close proximity aft and below the leading airplane a mutual interference takes place between the two airplanes. The leading airplane above will experience an effect which would be somewhat similar to encountering ground effect, i.e., a reduction in induced drag, a reduction in downwash at the tail, and a change in pitching moment nose down. The trailing airplane below will experience an effect which is generally the opposite of the airplane above. In other words, the airplane below will experience an increase in induced drag, an increase in downwash at the tail, and a change in pitching moment nose up. Thus, when the airplanes are in close proximity, a definite collision possibility exists because of the trim change experienced by each airplane. The magnitude of the trim change is greatest when the airplanes are operating at high lift coefficients, e.g., low speed flight, and when the airplanes are in close proximity.

"In formation flying, this sort of interference must be appreciated and *anticipated*. In crossing under another airplane, care must be taken to anticipate the trim change and adequate clearance must be maintained, otherwise a collision may result. The pilot of the leading aircraft will know of the presence of the trailing airplane by the trim change experienced. Obviously, some anticipation is necessary and adequate separation is necessary to prevent a disturbing magnitude of the change. . . ."

I emphasize the statement crossing under another airp care must be taken to anticipa trim change and adequate clea must be maintained, otherw collision may result."

As you can see, during a under, lead will experience dency to pitch down. The wi will experience a tendency to up. Obviously, a collision po does exist without any consci unconscious inputs by either In fact, the pilots involved mu ticipate and correct the pitchin dencies of their aircraft to a collision.

I have experienced this phe non while demonstrating the turebook" crossunder. As I c under lead with what initiall sufficient clearance, the a would rise and the vertica would pass through the jet wa the wing tip would vortice.

I always figured that I made mistake. The fact is that I w norant of the aerodynamic for volved. Fly safe—take spacin

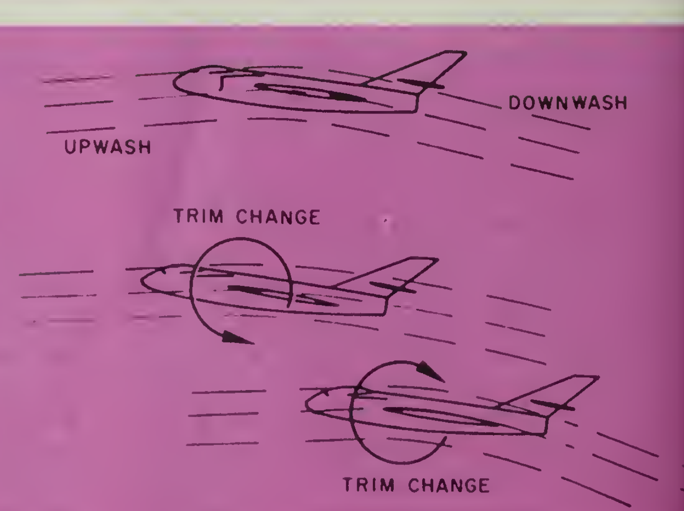


Fig. 1 Interference Between Airplanes In Flight

TRANSIENT SERVICES AWARDS REVISITED

he REX RILEY Transient Services Award program has been around for a number of years at one time carried quite a bit prestige. Transportation prob-, personnel changes, and re-ce cutbacks had somewhat of a mental effect and recently the ram has suffered. We're going and put a new shot of adrena-nto the award.

e, at the Air Force Inspection Safety Center, feel that one of mainstays of any installation's aft mishap prevention program e transient services, mainte-e, and facilities provided to vis- aircrews. The cross-country or transient aircraft presents opportunity for a mishap. Not only do visiting aircrews have unfamiliar surroundings, facilities, and landmarks to contend with, but often they are depending on the base food and billeting services to provide much needed crew rest before the next day's sortie. It is for these reasons that we are revitalizing the evaluation system of REX RILEY certifications. Hopefully, we will be able to visit or re-visit all bases in question within the next 2 years.

Our goal is an open-minded yet standardized look at the facilities of all bases with relatively high-volume transient traffic. We feel that this can't help but contribute and improve the bases' services. If the program saves a machine or aircrew, isn't that the name of the game? ★

THE

REX RILEY
Transient Services Award

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery. AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
EGLIN AFB	Valparaiso, FL
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
ENGLAND AFB	Alexandria, LA
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AL
PETERSON AFB	Colorado Springs, CO
RAMSTEIN AB	Germany
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
TORREJON AB	Spain
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
McCONNELL AFB	Wichita, KS
NORTON AFB	San Bernardino, CA
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RICHARDS-GEBAUR AFB	Grandview, MO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
CARSWELL AFB	Ft. Worth, TX
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayetteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND

A Personal Review

When Squadron Leader Peter A. Barratt of the Royal Air Force left his job of publishing the RAF's *Transport Aircraft FS Summary,* he summed up some of his experience concerning flying safety. We think his words make a lot of sense, so we are reproducing portions of his editorial for our readers.—Ed.

Let me begin with a rhetorical question—what is Flight Safety? I believe that we should not have flight safety, per se, at all. None of us, except for the occasional psychopath (and I trust that we have none of those) sets out to kill, maim or injure himself or his professional colleagues. It therefore follows that we aim for safety in our daily round, whatever that daily round might entail. It further follows that, for those of us whose daily round is aviation, our primary unstated objective is flight safety.

It has become somewhat fashionable to make "airmanship" the preserve of those who actually get airborne. I disagree; I believe that it is in making this mistaken assumption that we have been forced into creating a generic name such as flight safety. For me, flight safety is simply good airmanship; conversely, airmanship is the practicing of good flight safety principles. The two are as inextricably linked as to be one and the same thing. As an island race we have always depended upon the sea, and our sea-faring traditions go back a long way. Perhaps that is why, with only three generations of airmen, airmanship is far from being on a par with seamanship. And yet I believe it should be. I would like to suggest that we take a leaf out of our nautical brothers' book and instill a spirit of airmanship in all those who have any dealings with aircraft—if you like an "air-in-the-bones" philosophy in lieu of "salt-in-the-bones." We could then dispel any idea that flight safety was a subject in its own right with its own mystique and we could put airmanship back where I believe it properly belongs—in the cockpit, on the flight line, in air traffic control, amongst the support personnel and so forth—in short, with all those whose job is associated with putting aircraft in the air.

A few months ago I wrote in these pages about the reasons for putting men, rather than machines, into cockpits and onto flight decks. Even as I did so, I realised that I was not stating the whole truth. I stated that the advantages that men had over machines was in their adaptability, their flexibility and their analytical approach to problems. And yet we are in dang replacing those adaptable, flexible and analytical with "mechanical" men who merely follow the bo rote. Already we have seen accidents caused by a adherence to FRCs (flight reference cards [chec rather than a systematic approach to the problem. may be lucky, your emergency may appear in F but on the other hand it might not. Certainly, th ondary effects of any malfunction and any actio may take can only be known by understandin systems and logically thinking the problem thr Think up "new" emergencies for yourself and f them through; try them in the simulator if you one. Every one to which you have given prior th is one less with which to be taken unawares. again this is all airmanship—I believe we must back the man who is capable of logical and int thought; we cannot afford automatons in our pits. . . .

AIRCREW HAVE FINAL RESPONSIBILITY

Let me now turn to one of the specifics of the safety world—aircrew error. To err is human, have so often been told, and I cannot see anythin will radically alter man's fallibility. Aircrew erro become a very emotive issue. It is the aircrew have the final responsibility and, more often tha it is the aircrew who also have the unenviable ta trying to sort out the situation when it is all goi worms. But we have become too accustomed to s ing the pianist even when the piano is out of tu when the score is wrong. Simply because the ac situation occurs at the final man-machine int (i.e., pilot-aircraft) we should take more care b we rush in and blame the pilot. Conversely, whe pilot is skillful enough to rescue a situation tha not of his own making, we should be much more to heap acclaim upon him. Furthermore, I woul to extend this argument to those other members chain referred to earlier.

Virtually every accident has a human cause human error can occur when the specification is ten, when the specification is turned into a d when the design is turned into metal, when the pr is tested, and finally when the aeroplane is pu service. Even here the human error can be made b one of a thousand people involved in the air

ration, its maintenance and all its other support
vices. Fortunately, each stage acts as a cross-check,
lom is any one man acting in isolation and, further-
e, we impose a system of controls and feed-back
os, all of which serves to eliminate the potential
dent. However, we know from experience that,
ever small the mesh, sooner or later one will still
through the net. Even then the accident may be
ded because its potential may be recognised in
and the appropriate remedial action taken. How-
, the human-being will continue to show its limita-
s—limitations in perception, limitations in under-
ding, and limitations in reaction and implementa-
No, let us think twice before shooting the pianist,
om will he not have been giving of his best even if
est still costs us an aeroplane. On the other hand,
breaches of discipline should be dealt with swiftly
e distinction can be made more easily by those on
sidelines.

AT IS FLIGHT SAFETY?

erhaps we should return to the current definitions
ight safety at least as we see them in the Royal Air
e. The aim of Flight Safety is the reduction to a
mum of human and material losses due to aircraft
lents. The chief reason for an active pursuance of
a policy is simply because we can ill-afford either
of loss. Accidents erode our already overstretched
ces, they eat into that intangible called morale,
urthermore we have an accountability to the gen-
public who want their money used for their de-
rather than for us to throw it on the scrap-heap.

PROFESSIONALS WE TAKE PRIDE

ving said that, I believe that few, if any, of us
ctually conscious of these factors in our own flight
philosophy. I said it earlier but it bears repetition
ne of us actually wants an accident to occur. The
ccident prevention motivators, I believe, are such
as the value we put upon our own and our col-
es lives and, furthermore, as professionals, we
pride in doing the job to the best of our abilities.
is in this same area where all too often we fall
As members of the aviation community, flight
is part of the community spirit. Only a few of
assigned to fly the aeroplanes but all of us have
onsibility for their safety. It is a small air force
days and when an accident occurs the word travels fast. Often we will know the pilot or a member of the crew. Some of us will look at the cause and say —"I thought that would happen some day" or "That almost happened to me, but. . . ." How many people to whom it nearly happened or who thought it would happen actually told someone about their experiences or their fears? Where was their sense of community spirit? Are their consciences clear when the question is asked "Could this accident have been prevented?" Sometimes to voice our thoughts in this way will necessitate an integrity of the highest order. Sometimes to do so will be to appear foolish to our peers and our masters alike. But surely our sense of community spirit can overcome that, surely our commitment to aviation is bigger than that, and just as surely our peers and masters must respect our appearing foolish for the great degree of moral courage it really is. If ever a climate is engendered that tends to keep our mouths sealed we must do all we can to break those seals. A prerequisite of flight safety is communication and in an age of ever advancing communications, it is sad to see us performing so badly at the simple art of communicating. By failing to communicate, all we can be sure of is that we are, in effect, condemning a friend or colleague to death. And when the tragedy occurs, those of us who had the knowledge which could have prevented it, but kept it to ourselves, are as the perjured witness, the crooked judge and the biased jurors in a bogus trial leading to the execution of the innocent. . . .

FLIGHT SAFETY . . . WHERE IT BELONGS

Let us, therefore, abolish flight safety and recreate airmanship. Let us put flight safety back where it belongs in our personal approach to our jobs. Do pass on your good ideas all the time, not just when we visit, for not to do so is a form of complacency. Let us recognise that, for as long as men are part of the aviation interface, we will have human error accidents, but let us not shoot the pianist simply because he produces cacophony rather than harmony. Let us open up our own hearts and see if they contain any useful pointers towards the causal factors of accidents and then let us tell someone of responsibility to tell us of their mistakes so we may forewarn others. Finally, let us take the broader view so that we all contribute to a learning curve for our profession in toto rather than each having his own. . . . ★

WATCH YOUR TAIL

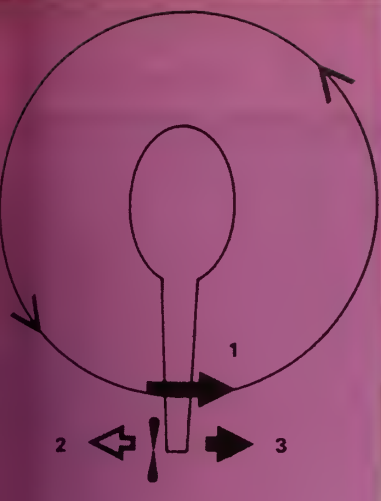
"RECOMMEND THE
CRAFT COMMANDE
DOWNGRADED TO
WING ONLY!" This messag
sent after the aircraft comm
had his third tail rotor strik
ing training operations in S
east Asia. The aircraft comm
mentioned was a very experi
pilot with many hours flying
he had been wrenched fro
security of the large fixed
world and sent to fly helicopt
SEA. In all his hours of flyi
had never had to worry abo
tail, but the time had come.

In researching for this a
I not only reviewed the areas
monly known by helicopter
but I also came across term
Tail Rotor Drift, Tail Rotor
Tail Rotor Droop, and Tail
Breakaway. This article wi
only be an introduction for
ested fixed wing pilots and
view for current helicopter
but it also may have a new
or two for the dedicated old
tor-heads.

TAIL ROTOR FUNCTIO

As you may know, a heli
is maintained in flight by t
tation of its main rotor b
Newton's Third Law states
for every action there is an
and opposite reaction." On
can single-rotor helicopter
main rotor system rotates co
clockwise, and because the
rotor uses fuselage-mounted
er, torque is generated
tends to rotate the fuselage
opposite direction. There a
eral ways of countering this
reaction, but this article w
dress only the use of a tail
The tail rotor's primary func
to compensate for torque re
but it is also required for
ing control, maintaining tr
flight and to stop the fu
from rotating in autorotatio

CAPTAIN JOHN G. TAYLOR, III • USAF/RAF Exchange Program



ʼ Direction of main rotor rotation.
2 Torque reaction rotates fuselage in opposite direction to main rotor.
3 Tail rotor counteracts torque reaction and provides positive heading control.

Figure 1 Torque Compensation

Torque Compensation Compen-tion for torque is accomplished a variable pitch, anti-torque ro- (tail rotor), located at the end a tail boom extension at the ar of the fuselage. Driven by the nsmission at a much higher m, the tail rotor produces thrust a horizontal plane opposite to torque reaction developed by main rotor (fig. 1). Since que effect varies when power anges are made, it is necessary vary the thrust of the tail rotor. s is done with the tail rotor dals which allow the pilot to er the tail rotor thrust by chang- the pitch on the tail rotor des.

Heading Control In addition counteracting torque, the tail or also permits control of the icopter heading during taxiing, vering, and sideslip require-nts during takeoffs and ap-aches. Application of more con- than is necessary to counter- torque will cause the nose of helicopter to swing to the left. nversely, less pedal than re-red to counteract torque will mit the helicopter to turn in the direction of torque, to the right. To maintain a constant heading at a hover or during takeoff or approaches, the pilot uses the tail rotor pedals to apply enough pitch to the tail rotor to neutralize torque and possible weathervaning effect in a crosswind.

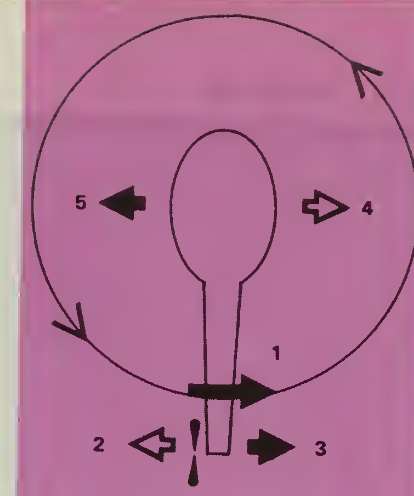
Trimmed Flight Heading control in forward trimmed flight is normally accomplished with cyclic control, using a coordinated bank and turn to the desired heading. Whenever power changes are made during flight, tail rotor pedals must be adjusted accordingly to maintain trimmed flight.

Autorotative Flight When the rotors are being turned purely by the reaction of the rising airflow as the aircraft descends and with no assistance from the engine, there will be no torque reaction. However, friction will cause the fuselage to rotate in the same direction as the main rotor. Directional control is maintained by changing the pitch on the tail rotor to such a degree that the tail rotor produces a thrust in a direction opposite to that required when the rotor is being driven by engine power. The tail rotor blades are symmetrical in shape and are capable of being turned (feathered) to produce plus or minus pitch values.

TAIL ROTOR PHENOMENA

Now that we are aware of the wonders a tail rotor can do for us, what are some of the phenomena associated with the tail rotor?

Tail Rotor Drift When hovering, the helicopter has a tendency to move laterally (to the right) due to the tail rotor thrust component (see fig 2). This tendency is called tail rotor drift and can be overcome by a pre-set tilt in the rotor hub or by the pilot tilting the main rotor slightly to the left. This lateral tilt results in a horizontal force to the left equal to and compensating for the tendency of the helicopter to drift to the right (see fig 2).

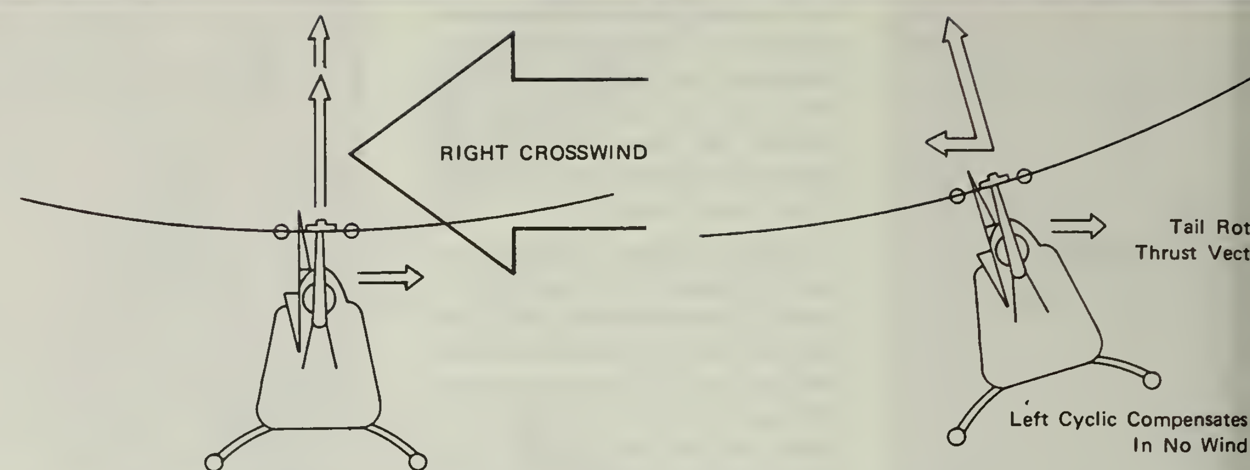


1. Direction of main rotor rotation.
2. Torque reaction rotates fuselage in opposite direction to main rotor.
3. Tail rotor counteracts torque reaction.
4. Tail rotor pushes entire helicopter into a right drift.
5. Pilot applies left cyclic to prevent right drift.

Figure 2 Tail Rotor Drift

Tail Rotor Roll Unless it is unbalanced, a fuselage suspended by a semi-rigid rotor system should hang level laterally (see fig 3A). However, the mast is often rigged to have a forward tilt to provide a level fuselage in forward flight which also results in a tail-low hover (see fig 3B). Some helicopters also have the tail rotor gearbox positioned below the main rotor hub. If the horizontal thrust of the tail rotor acts below the main rotor hub it will result in an unbalanced couple between the tail rotor hub and the main rotor hub (points of thrust application) tending to tilt the left side low during hover (see fig 3B). This tendency is called tail rotor roll. So, although the helicopter has been loaded within the lateral center of gravity limits, it will still hover with the left side low. This roll can be minimized by positioning the tail rotor high enough (on a py-

Figure 3 Tail Rotor Roll



NOTE: All figures in this article are hand drawn from figures in U.S. Army Field Manual FM 1-51, Rotary Wing Flight. Some portion of each Army figure has been changed to better prove my points.

lon) to reduce the couple, but this minimization point will only hold true for one position in the flight regime. Every time you change the nose up-down attitude of the aircraft the roll will either increase or decrease. The attitude is also dependent upon the gross weight and the density altitude at which the helicopter is operating, for as the weight or height increases so does the requirement for power for the main rotor and therefore the tail rotor. More tail rotor thrust creates more tail rotor drift which requires more left cyclic to arrest and therefore an increase in the left rolling tendency called tail rotor roll.

TAIL ROTOR PROBLEMS

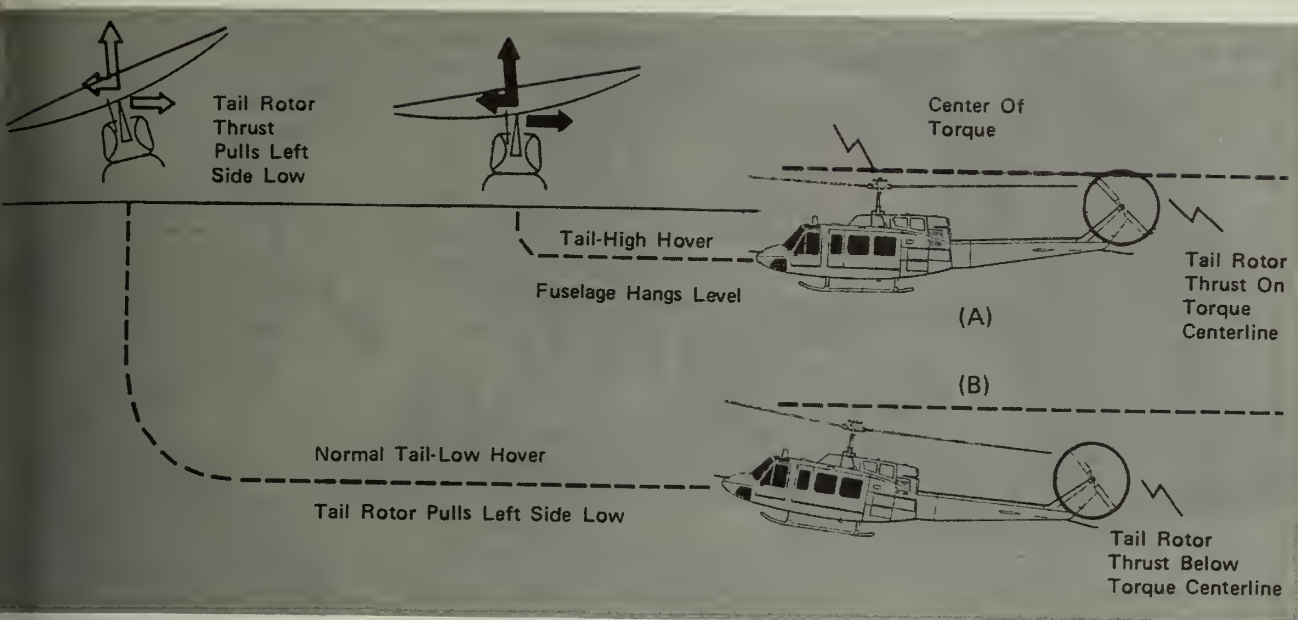
The tail rotor not only performs wonders, has phenomena, but it also causes problems. Most tail rotor problems are associated with its power demands which can lead to Tail Rotor Droop and Tail Rotor Stall.

Tail Rotor Power In order to produce tail rotor thrust, lift must be produced in a horizontal direction. The production of this lift causes drag which causes an increased power requirement. An increase in the power required by the main rotor must result in an increase in the power required by the tail rotor to maintain heading. In small helicopters approximately 5 per cent of the available power is coupled to the tail rotor, whereas large cargo helicopters have to have up to 20 percent of their power available to the tail rotor.

Tail Rotor Droop We are aware that the tail rotor is connected to the main rotor transmission at a constant ratio and, therefore, for each given rpm of the main rotor there is also a given rpm for the tail rotor. Since main rotor demands automatically regulate engine power output, the engine may be unable to provide enough power to meet the main rotor demands. If the main rotor demands more power than the engine has available the main rotor rpm will begin to decay and, therefore, the tail rotor rpm will also begin to decay. As the tail rotor rpm decays so will the tail rotor thrust decrease, unless more pitch is applied to the blades. This will require more power from an already over-tasked power system, leadin more decay and ultimately in ficient thrust for the tail roto maintain heading, causing nose of the aircraft to abruptly to the right. At point, attempted tail rotor p corrections of more left p have only made the situa worse, the pilot's only ac should be to unload the m rotor power requirements, th by allowing the main rotor to increase and in turn allow the tail rotor to increase its and ultimately its thrust to the yaw. Hopefully the pilot have enough altitude to acc plish the necessary main r unloading and get into the fl regime of translational lift. M flight manuals have graphs wh allow the pilot to predict at w main rotor rpm he will begin lose his tail rotor effectiven This rpm will be dependent u temperature, density altitu and aircraft gross weight.

Tail Rotor Stall The sa yawing movement caused by rotor droop can also cause tail rotor to stall. When the n of the aircraft swings abru to the right, the pilot's initial

ıre 4 Right Crosswind Effect



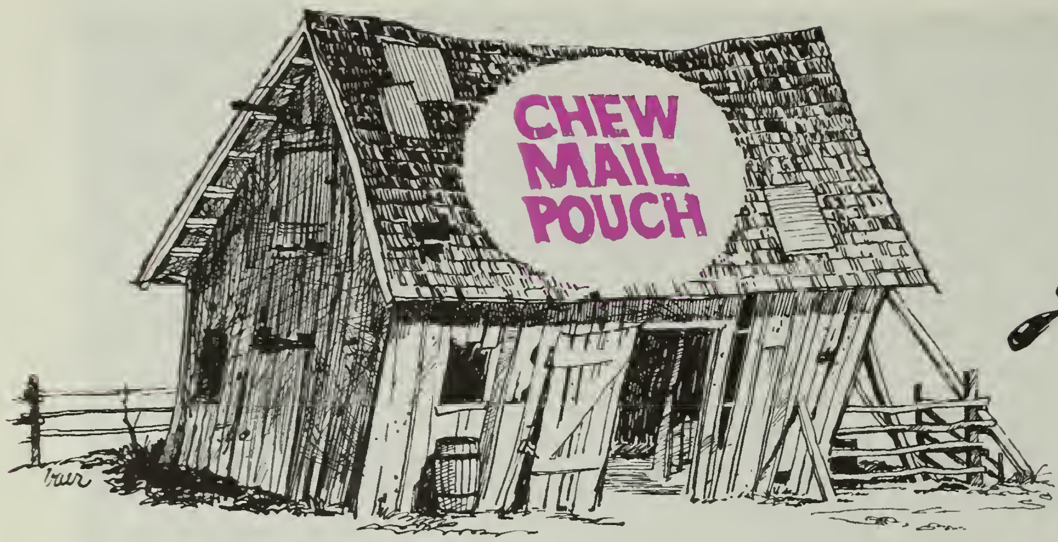
ion to increase collective and ɔly more left pedal will aggra-e the situation. Not only is the rotor losing rpm but also by pilot applying more left pedal, is increasing the angle of at-k of the tail rotor blades and rotor itself is passing through own turbulence. Combinations these factors may cause the rotor to stall.

Tail Rotor Droop/Stall Recov- Anticipation of conditions t could cause main rotor op should begin during pre-ht planning and then early ognition of main rotor droop is ential to safely initiate correc- actions. If main rotor rpm ins to decay rapidly during h power applications, then er the collective, increase air-ed, initiate a right turn to ɔad the tail rotor, and go und while there is sufficient tude. Attempts to salvage an roach to a hover or landing only increase your chances n accident.

Crosswind Considerations ht Crosswind—because of the uirement to tilt the rotor to the to stop tail rotor drift, a small sswind from the right may alleviate the amount of left cyclic and therefore level the main rotor disc reducing the power required by canceling the horizontal component (see fig 4), but in most cases this benefit could be canceled by the requirement of additional left pedal to prevent weathervaning. This additional power requirement would increase as the crosswind increases until the wind approaches10-12 knots and then the power requirement would reduce as the main rotor system encounters translational lift.

Left Crosswind Airflows from the left can produce difficulties with directional control. With a 5-15 knot wind from the left, the tail rotor can be experiencing recirculation problems, where it is actually moving in the same direction as its induced air flow and into its own turbulence. The result is frequent changes in the pedal position, which is uncomfortable for the pilot trying to be accurate with his heading control. But a crosswind from the left rarely causes power problems because the tail rotor pitch setting is low. A phenomena called Tail Rotor Breakaway can be caused by a left crosswind due to blanking of airflow to the tail rotor by the tail rotor pylon (most American helicopters have the tail rotor mounted on the left side of the tail rotor pylon). The result of this airflow blanking can be a loss of directional control and excessive power demands.

We have discussed how useful a tail rotor can be to counteract torque, maintain trimmed flight, and to provide heading control throughout the helicopter's flight regime. Despite its good points there are also some bad ones: Tail Rotor Breakaway, Tail Rotor Droop and Tail Rotor Stall, all of which can be caused by excessive power demands. I must stress that flying within the authorized flight envelope of your aircraft will allow you to avoid all these tail rotor problems and that there is much that can be done to anticipate excessive power demands during preflight planning. Only anticipation and early recognition in flight will allow the pilot sufficient time, hence altitude, to recover the situation. But none of these precautions will be of any use to you if you allow your tail rotor to strike an object and damage or lose it. So BE AWARE and do not allow yourself to be "DOWNGRADED TO FIXED WING ONLY." ★



MAJ GEN PERRY B. GRIFFITH
USAF, Ret.

Nicotine and I first entered the ring when I was eleven, and vacationing on our ancestral Pennsylvania farm.

Having heard me brag about the Philadelphia A's, a bunch of village boys (some, shirttail cousins) invited me to play baseball in a pasture behind the mill. As I was such a hotshot, they said I could pitch.

All cheeks of these little rustics bulged with big lumps—like the ballplayers' cheeks in A. J. Reach's *Baseball Annual*. I asked one kid what he was chewing. Pulling a filthy packet from his overalls, he unfolded it and offered me some. It said what was painted on a near-by barn, CHEW MAIL POUCH.

I stuck a handful in my mouth, sauntered to the mound, warmed up, then threw three pitches.

Suddenly my head expanded to eight times normal size, Roman candles, sparklers, walls of enemy flak exploded inside it, and swarms of ballplayers grotesquely whirled around me the same way First Act Finales of all Broadway musicals end.

Descending onto a cow chip, next, some older kids were soaking my head in the pasture-bisecting mill run, I was in convulsions and the other pre-adolescent, village idiots were rolling on the ground, to see this city dog—me—visiting the country dogs and, now, slowly twisting in the wind.

The following round in this melancholy bout took place on Saturday, a week before my high school graduation.

A mechanical drawing teacher told me to finish some derelict work or else; so I borrowed my father's car to go to the school. His raincoat was on the seat and, as it was drizzling, I wore it into the building. I noted that his empty pipe had been left in a pocket.

While drawing, I remembered the pipe, idly stuck it in my mouth and hardly noticed the door open when the janitor—old walrus-moustache four eyes—looked in to find out why the lights were on.

Monday morning, I was sum-moned to the vice principal's of and accused of smoking in a c room; particularly reprehensibl because my dad was the city sch board president (they later nam a school for him), my grades we passable, and I was president o Mathematics Club. Some exa for the other kids, they said.

All rebuttal was dismissed ou of hand. I was a criminal, suspe sion until graduation was my punishment, and I didn't even smoke.

So a week was spent, hiding f the firestorm and playing tennis with a local buddy, Frank Schw who had beat me out on an An-napolis appointment, and was straightaway leaving to become Navy plebe.

When some expert from out town handed us our diplomas, a of laughter filled the auditorium when I got mine, my mother was too ashamed to attend chuch for spell, and dad would glare, grab golf clubs and leave for the link

uld sneak to a window and watch
1 to his car, shaking with ill-con-
led laughter. The air, therefore,
; clear. For he, too, once had
n a boy.

While at West Point, my room-
te smoked. I tried to learn in
defense. But my Wellesley girl
n't smoke, and as I was on the
mming team and the coach was
chotic about smoking, it never
k.

Graduation summer, five class-
es and I joined the Midshipman
ise in Europe. My confederates
smoked. With five to one, I
lly got wacked out by what
sed for cigarettes in Europe—
ittle more than fertilizer,
led with nine letters. But I had
ed the club.

hortly before WW II, the girl I
lly married had our first child.
ore a cure for the negative Rh
or was discovered, the baby
ered between life and death for
days.

erhaps because the inflections of
prayers for mother and child
nt be more meaningful in so
g, on the fifth day I quit smok-
The baby rallied and never has
desperately ill since.

uring the war, as responsibilities
somed, my vintage shot up fast.
y on, I had a squadron, then
p, overseas, in the tropics.
yone smoked. But the cigarettes
damp and the Russian-made
ches wouldn't strike. So you
y had to be hooked to work

or something to do in the ops
er and during long hours in the
pit, I started again. (This is
it as predictable as a rerun of
gan's Island, isn't it?)

nen, in the late Forties I had
impacted wisdom teeth re-
ed. Afterward I tried to smoke,
he taste was so foul that I threw
offin nails away and didn't
ce again for three years—when
nd myself spinning in the vortex of the Air Staff's Directorate of Plans and Operations.

I was to spend six years in Washington—too long for anyone who hopes to preserve his sanity, save a congressman, and in that racket you don't seem bound by the same code of ethics we in the military forever have set our course by.

I began anew. I'd fire up, take a puff, stub it out, whirl my chair around, cough, vaguely stare through my vapors at the good-looking secretary twenty feet away in the Pentagon's next ring, then return to work.

Between cigarettes and coffee all day and martinis at night, I survived. But I was getting like Rodney Dangerfield, who said one morning, "The first thing I've gotta do is find whose car I drove home last night. The second thing is, I've gotta find the guy who drove my car home."

Finally, more dead than alive, I was sprung and got command of an air division. By then I was smoking cigars (the in-thing for youngish, show-off, AF file-boners, because you-know-who smoked them).

After a good tour, I found myself back on the Air Staff as the USAF Deputy IG but, thank God, with my end headquartered out at Norton Air Force Base, California.

So along came time for my annual inspection of USAFE. On completion, we gave the final briefing to the CINC, General Ted Landon, once my boss in the Pentagon, a gifted leader, an easy keeper, as horsemen say, and one who never disrupts things unless smoke is rising.

The pressure was off, and we were outward bound. The flight steward had laid in some good German cheese, bread and wine, for those who didn't have to fly. We had our own bird. I took it off, climbed to altitude, then turned the yoke over to the next pilot and went aft.

My aid, Captain Charley Woods (now a major general selectee on

I need smokes like Dolly Parton needs falsies.

CHEW MAIL POUCH continued

the Air Staff), our surgeon, Colonel Ken Pletcher (later to become the AF Surgeon General), and my exec, Colonel Paul Douglas (later to be a brigadier general), a WW II Ace who once shot down five Jerries in one fight, were grouped around a table where they graciously had left me a little food.

After gorging what was left, I asked Charley for a cigarette, lit up and settled back to watch the English coast come up.

Suddenly, Ken—who is the genius who thought up those signs seen in all AF hospitals, WE THANK YOU FOR NOT SMOKING HERE—reached over, yanked the butt from my fingers and stomped it out.

My impulse was to go over the table, seize his throat and ask him to make a funny noise. But I didn't.

That was fifteen years ago. I haven't smoked since. I have not missed it, and if I confined all my problems to a nose, eyes, throat and lungs, there's nobody who's in higher cotton, unless it's a relative of the president.

Long ago I learned that booze and I don't mix. I like the damn stuff's taste, but it does strange things to me, puts me to sleep in odd places, and at one USMA reunion, I rather innocently walked into a broken nose.

I've never flown to the moon with Timothy Leary on LSD-fashioned, gossamer wings, and I wouldn't know the smell of pot if I shlepped naked through all those turkeys at a Woodstock Festival.

But I know booze and I know nicotine, and I need both like Sadaharu Oh needs a glass eye, like Dolly Parton needs falsies and like Joe Namath needs computer dating to find a date.

Smokers and boozers think that to stop you need the insane, impulsive will power that motivates one to run for mayor of the mare's nest that's called New York City.

Not so. You don't have to shell out bread for pills, hypnotic courses and all that jazz.

You just quit. That's all!

Or you have some guy like Pletcher shove your back to the wall. In about two days you never miss smokes again, and after the hangover subsides, you simply shun booze and drink tonic water at parties. It ain't too simple, but it works.

"But," one says, "what have you got to live for?"

Well, everyone has a few private vices that get nobody else in trouble. I figure: Live it up otherwise. You've run the course and taken all the fences—in a clumsy sort of fashion—but you're still
the saddle and the cockpit.

Someday, though, in compan
with all other hell-raising milita
pilots and ex-cavalrymen, I'll h
some accounting to do with the
CINC who minds the muster a
flight line up in Fiddler's Gree
airdrome and stables. But I'll h
plenty of company—most of th
friends of long standing.

And it all began with a gaggl
country-jake, tobacco-chewing,
devils and a bloody, four-eyed
tor who couldn't see straight.

Major General P. B. Griffith wri
the aviation and international press.
Associate Editor of Horse and Hor
magazine, and was one of four U
tors accredited to cover the equ
events at the '76 Olympics. Recen
has been following the US Equ
Team screening trials and Modern
thlon World Championships. In 19
cidentally, before going to pilot
ing he won the US Cavalry Pent
Championship at Ft. Riley, Kansas

I need booze like Sadaharu Oh needs a glass eye.

OPS TOPICS

WATCH OUT

• An FB-111A was on an IFR low-level bomb run when the pilot noticed a single-engine light plane pass approximately 300 feet in front of his aircraft. The light plane driver apparently never saw the fast-mover.

• A T-37 was practicing VOR holding in VMC at 7,500 feet MSL. The IP observed a light aircraft on an apparent collision course and took evasive action.

In both of the above cases, the military aircraft was on a hard IFC clearance in radar contact with the controlling agency. REMINDER—Don't let IFR clearances, transponders, separation altitudes or other "traffic protection systems" lull you into security. By the same token, don't get so involved with your in-cockpit action (practice instruments, bomb runs, checklists or inflight malfunctions) you neglect the lookin' around outside.

ANIMAL FOD

Recently, an aircraft aborted takeoff when the pilot thought he had hit a small animal soon after beginning his takeoff roll. Later that same day, another aircraft had to brake hard to avoid cows on the active. An unusual example? Maybe, but on a smaller scale these incidents serve as a good reminder for:

• Flight crews—Just because there are no other aircraft on the runway, don't assume the active is clear of obstructions.

• Tower personnel—Get in the habit of scanning the entire runway environment for stray animals, people, or other hazards to aircraft.

• Airfield management personnel—When was the last time you had the entire airfield area checked for holes in the fence, animal nests, or other possible origins of animal FOD?

ALERTNESS COUNTS

A C-130 executing an ILS monitored approach was forced to execute a missed approach because of a vehicle on the runway. The senior tower controller cleared the aircraft to land when he was 6 miles on final. Two minutes later an airfield lighting truck requested clearance onto the runway. The senior controller cleared the truck onto the runway, having forgotten about the previously issued clearance to the C-130. The pilot acquired visual sighting of the runway when approximately 100' AGL and approaching the landing threshold. He then saw the truck on the runway edge and executed a go-around. Another ILS was flown to full stop. The tower was manned by a senior controller and a controller assigned to flight data. The flight data controller had just returned from the equipment room after completing a recorder check. He was unaware of the clearance for the aircraft to land. The senior controller had become distracted after the clearance to land by becoming involved in a coordination of alternate communications procedures on the primary crash net. This could have been a bad one! A good reminder for all to constantly clear the runway and airfield environment. ★

USAF IFC APPROACH

IN RETROSPECT

The USAF Instrument Flight Center (USAFIFC) is scheduled to close 30 June 1978 with its many functions being transferred to other USAF units. This closure ends a 34-year flying tradition. The Instrument Pilot Instructor School (IPIS) portion of the USAFIFC closed 31 December 1977 which was the first interruption of service since school operations began at Bryan Field Texas, 23 March 1943.

The creation of IPIS signified a dramatic change in aviation philosophy. A statement of the Commandant, Air Corps Primary Flying School, Brooks Field, Texas, 15 August 1928, clearly represented the old philosophy: "Flight by means of an artificial horizon has no place in primary or basic training." Visual flight reference was the order of the day and this position was generally supported until the early years of WWII when it was recognized that more aircraft were being lost to flight under instrument conditions than to combat-related causes; IPIS was developed as a corrective measure.

Since those early beginnings, IPIS evolved from an instrument proficiency course to a graduate level instrument instructor school. Not limited to "How to Fly the Gauges," the final course encompassed t and practical applications of flight instruction, tional communication techniques, and an aca environment for in-depth study of instrument related materials. Throughout those 34 years 19,000 select instrument instructors from all COMs, the AF Reserve, Air National Guard, a foreign countries have attended IPIS. Depending the vintage, in-flight training was conducted wi AT-6, B-25, T-33, T-29, T-39, or T-38 aircr helicopter course, using the UH-1, was add 1973. Training was detailed but broad enou scope to accommodate the diverse needs of in tors from a variety of aircraft types and missio

With changing times and advancing technol the military flying community needed an org tion to train an instrument instructor cadre, search flight instruments and systems requirem to develop and standardize instrument flying dures, techniques and training methods, and t vide this information to the pilots in the field. requirements led to the development of the Instrument Flight Center on 1 May 1972. The IFC was created by expanding the IPIS to sus progressive instrument program for the enti

These are the aircraft used by IPIS for instrument training from 1943 to the closing of the school 31 December 1977. Clockwise on this page: AT-6, T-33, T-29, B-25. Opposite: T-38, T-39, UH-1.

By the USAF Instrument Flight Center
Randolph AFB, Texas 78148

rce. The Center was the focal point for all matters ated to instrument flight. The Center had three jor divisions: IPIS, Flight Standards, and Research l Development. The Flight Standards Division pro- ed the USAF with a standardization process for the and development of instrument approach and ding charts, flying directives, and instrument fly- techniques. This division also wrote the "USAF- Approach" article which has appeared monthly he USAF **Aerospace Safety** magazine. These func- s will be transferred to the following organiza- s and future questions should be directed to e agencies:

TC/DOTO, Randolph AFB TX AV 487-5834
AFM 51-37, AFR 60-16, Instrument Refresher Course, and Annual Instrument Exam

ir Weather Service, Scott AFB IL AV 638-4731
AFM 51-12

AC/DOCS, Scott AFB IL AV 638-3391
AFM 55-48

FCS/FFO, Scott AFB IL AV 638-4451
AFM 55-9, AFR 60-27, ICAO TERPs, NATO TERPs

FCS/FFO, Scott AFB IL AV 638-5479
FLIP Changes and FLIP Operational Requirements

The Research and Development Division, in cooperation with AFSC and other organizations, conducted pilot factors testing, evaluated instrument control, display and guidance systems. They also were deeply involved in the Microwave Landing System (MLS) Program. The MLS function is the only function being transferred. It will be at the 4950TW/DOCB, Wright-Patterson AFB, OH AV 787-4610. The personnel of the USAFIFC have supported the mission of instrument flight for over 35 years and have contributed to the current high level of all-weather flying expertise within the USAF. With the knowledge of a job well done, they can honestly look to the future with pride in the past.

The "USAFIFC Approach" feature has provided vital information for aircrews for 13 years. With the Instrument Flight Center closing, this is their last article. We are working on a substitution and hope to continue the series from another source. Our sincere thanks to the people who have written the "Approach" articles over the years. There have been many, and each has contributed to flying safety. —Ed. ★

Mail & Miscellaneous

Send your ideas, comments, and questions t
Editor, Aerospace Magazine
Norton, AFB, CA 92409

THE FIGHTER PILOT'S BREAKFAST

Lieutenant Banta's article on this subject in your January issue was truly outstanding and worthwhile. All of us should take heed, regardless of our duty assignment.

I'm encouraged that we already appear to be making progress in the nutritional program. This progress is most evident in the upgraded Fighter Pilot's Breakfast footnoted in the article. It's a quantum leap forward from the old WWII "Brown Shoe" counterpart. Ours was more austere and consisted of a cup of black coffee, a cigarette, and to regurgitate—in polite usage. A midmorning snack of 100% oxygen usually followed to carry the body through till lunch. Somehow or another, some of our young bodies survived. How, I don't know. But the going accident rate appeared to be a direct function of our morning's nutritional input.

I look forward to the next great leap forward in the Fighter Pilot's Breakfast, Mark III. Perhaps it will herald the arrival of that perfect zero accident rate we have been after for all these years!

STANLEY F H NEWMAN, Brig Gen, OKANG
Commander
137th Tactical Airlift Wing
P.O. Sta. 18, Will Rogers World Airport
Oklahoma City, Oklahoma 73169

NOMEX FLIGHT CLOTHING

The article on Readiness in the January 1978 issue of **Aerospace Safety** shows a picture of a C-141 pilot with improper wear of his protective flight clothing. Rolled-up sleeves and turned down gloves may look cool in a photograph but they have no place in our flying. Unfortunately, the picture is typical of many aircrew members use of protective flight gear.

If every crew member were given a tour of Brooks Army Medical Center, Burn Ward, to see the results of neglect and misuse of flight gear, they would be aware of the serious consequences of fire to exposed skin. As shown in the picture on page 1, the rolled up gloves act only as a chimney to funnel heat into the hands. Heat from the typical turned-under sleeve can funnel up as far as the back. Although the "we don't need it" attitude is more common in heavies, there is seldom time to cover up before the accident occurs. Few people have the presence of mind to pull out their gloves and cover up as they depart the runway.

We in safety education need to keep reinforcing our aircrews in proper use of the excellent protective gear the Air Force provides us. If the aircrew involved was a select lead crew with two flight examiners and three instructors, proper wear of flight clothing was not part of their instruction of evaluation as should be the case. Aircrews in those positions should be the ones to set the example so crew members they come in contact with will "get the idea." Hopefully we can get every aircrew member to make safety gear a part of his Before Takeoff Checklist.

HAROLD N. CARTER, Captain, USAF
Chief, Physiological Support
USAF Clinic Kadena (PACAF)
APO San Francisco 96239

You are perfectly right about the proper wear of flight gear. We will work harder at selecting photos that show only proper wear.—Ed.

F-111 COPILOT

In your article "Communications" under the Ops Topics in the April 1978 issue of **Aerospace Safety**, you referred to the F-111 copilot. I would like to point out to you that the F-111 right seat crew member is known as the Weapon Systems Officer (WSO) and not copilot. The WSO can be either a navigator or pilot, but the majority are navigators.

Enclosed is the T.O. 1F-111A-1 Glossary.

DONALD M. MAY, Colonel, U
Assistant Deputy Commande
for Operations
366th Tactical Fighter Wing
Mountain Home AFB, Idaho

You caught us with our down. It's sharp-eyed people— will tell us—who keep us h Thanks!—ed.

Please sha
this magazin
with your fell
crew membe

ITS DESIGNED TO BE SHA
WITH TEN PEOPLE... AND
CAN NEVER BE SURE WHA
THOSE NINE OTHERS MIGH

NEWS FOR CREWS

Information and tips to help your career from the folks at Air Force Military Personnel Center, Randolph AFB, TX.

CAPTAIN HERB JENNESKENS
Air Force Military Personnel Center

We at AFMPC realize that many of you do not have time to keep abreast of the myriad of changes, updates, and revisions that are hap-ing in the personnel arena. We'd like to present apsulized review of some items you might find resting or significant.

trategic and Tactical Sciences Program (AFIT). recently initiated 18-month graduate program s to a degree of Master of Science in Operations earch. More specifically, the program prepares Force officers for operational staff (not rated plement) assignments involving selection, plan-, and optimum use of conventional and nuclear oon systems. The curriculum includes individual class exercises in planning and targeting prob-s for both strategic and tactical scenarios. Gradu-will be qualified for responsible positions as Air e strategists and tacticians. Admissions criteria ıde a baccalaureate degree in engineering, chem-, physics, mathematics, or a degree from a ser-academy with appropriate major. Grade point age should be above 2.5. All students must have the GRE apptitude test. Interested? Write: /RR, Wright-Patterson AFB, OH, 45433, or call OVON 785-2549. AFMPC point of contact for officers is Capt Herb Jenneskens, AUTOVON 5081, and for support officers Maj Paul Kintz, OVON 487-3474.

ASA Astronaut Candidate Program. The recent tion and announcement of 35 new astronaut dates include 10 Air Force officers. All will en-two-year training and evaluation program prior ıal selection as astronauts. For you future po-l "selectees," the application requirements are cted to remain as minimums, but a review of previously selected shows a definite trend to-advanced degrees in mechanical, electrical, or autical engineering, or earth, space, or life ce with good research or experimental back-ds. NASA expects no additional recruiting with-e next two and one-half to three years and will ccept applications until announcement of a new tment program. If interested, now may be the o increase your competitive advantage.

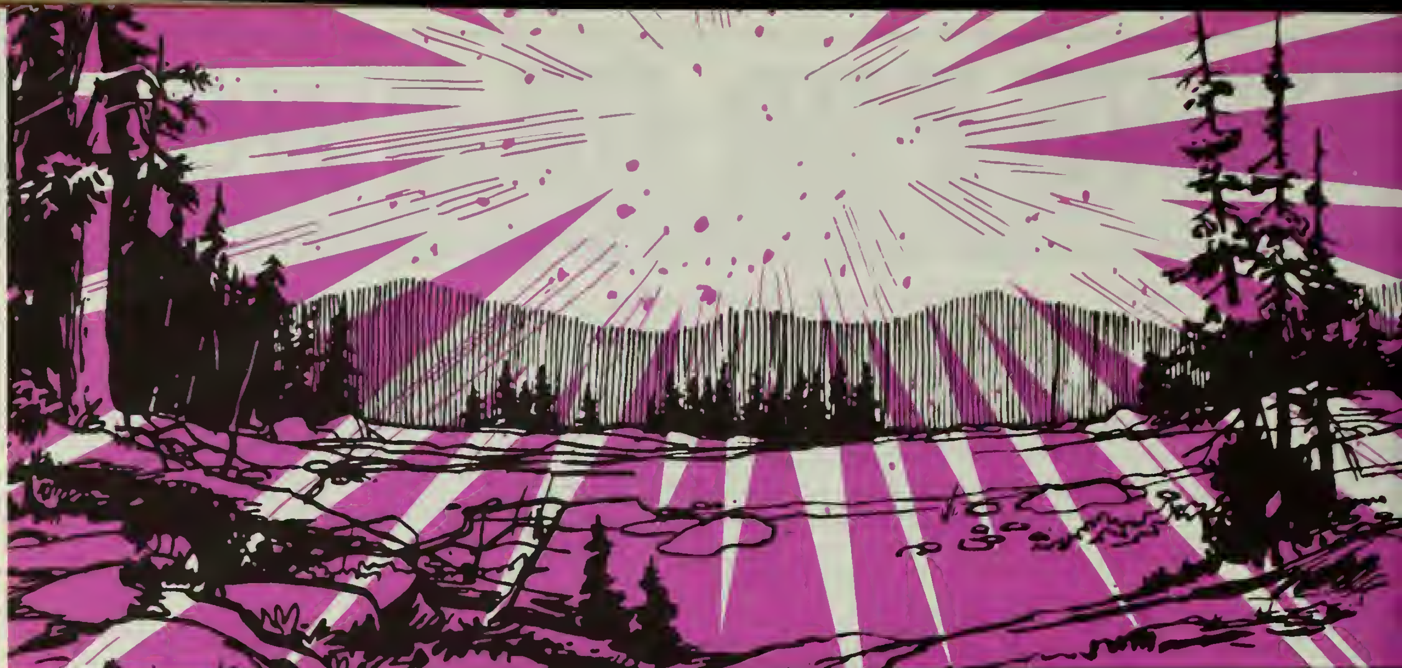
Special Experience Identifiers (SEI). On 1 May 1978, an expanded special experience identifier (SEI) coding system went into effect at AFMPC. SEIs are used to flag the records of personnel with unique experience, education, or training not normally reflected in an AFSC or associated prefixes and suffixes.

What does this mean to you? We expect the new SEI system to assist us in better matching people and jobs, reduce the time needed for you to "come up to speed" in your next job, and in general, assure that your records provide a true picture of your qualifications and abilities. SEIs will not be entered in the system for everyone immediately. Rather, AFMPC resource managers will review your records and designate applicable SEIs in conjunction with normal personnel actions such as reassignments, AFSC changes, scheduled record reviews, etc. If you don't want to wait and feel you have special skills, background, or experience that should be flagged with an SEI, have your local CBPO forward a request to AFMPC. A complete explanation of the SEI system and a listing of new SEIs are included in AFR 36-1, Officer Classification.

ATC Instructor Duty. AFMPC resource managers are always looking for highly qualified pilots and navigators to serve a tour of duty as instructors in Air Training Command. Continued MAJCOM interest and anticipated increases in UPT/UNT production have renewed the emphasis on instructor duty. Some benefits of an ATC tour include a three or four-year stabilized assignment, limited TDY, and excellent opportunities to function in supervisory positions. Selected individuals can expect to be returned to their original weapon system field upon completion of the ATC tour. If interested, contact your appropriate resource manager at AFMPC. ★

ABOUT THE AUTHOR

Captain Jenneskens is a Resource Manager in the Rated Departmental/Joint Career Management Section, AFMPC. His previous assignments have included ATC instructor duty and F-4 assignments in PACAF and USAFE.



NUCLEAR SURVIVAL

SGT WILLIAM F. BRITTON
Operations and Requirements Branch
3636th Combat Crew Training Wing (ATC)
Fairchild AFB WA

You have exited your aircraft and find yourself safely on the ground. Suddenly you realize that you have become another statistic in the present war. There are no enemy personnel in sight, and it seems that all you have to do is utilize the basic techniques that you learned at Survival School. A little bit of E&E, proper signaling, finding food and water, and you will have it made. After all, that's the way it's been in every other war you have read about. Spend some time on the ground and then get rescued. The problem is that this war has an added ingredient which was not found in any other wars. You are a survivor in a nuclear holocaust!

Hopefully, you (as a member of the Armed Forces) will never have to experience a nuclear survival episode. But no one can predict the future. One fact we can predict is that nuclear fallout will compound the problem of obtaining shelter, food, and water and will make difficult the everyday hygienic principles. It is important to realize that the basic principles of survival that were used in past conflicts **will** be applicable. But they'll have to be modified due to the varying amounts of radiation present.

Just how dangerous will the radiation be to you during a nuclear episode? This will largely depend on the proximity of the bomb blast site. Naturally, the closer you are the more radiation your body will receive. Depending on the exposure time, radiation will affect your body in different ways. Because radiation is tasteless, odorless, and invisible, it will be very difficult to detect.

There are three different types of radiation (alpha, beta, and gamma), all of which could be present in your situation. Alpha radiation is considered the weaker of the three types. These particles stopped by a sheet of paper, ing, or even your skin. Th only considered dangerous allowed to enter your body. radiation will not only dam ternal organs, but also the cells. Keep the radioactive d of yourself and use prope tective devices to keep fr haling or ingesting these pa

The second type of rad beta, **does have** an affect external parts of the body. posed long enough, the unp ed skin will burn, causing look as though you have a case of sunburn. The skin v come very sensitive to the and, if exposed for a long of time, blisters will appea can protect yourself from radiation by wearing mater moderate thickness (i.e., suits, fatigues, boots, etc.) keeping any exposed parts body as clean as possible.

re you do not inhale or ingest ese particles.

The third and most penetrating pe of radiation comes from gam- rays. These rays not only ss through your body, but also ough much denser material. u will be required to seek some e of shelter which will reduce number of these penetrating s. It is the gamma ray which ises the greatest concern in a clear survival situation. Extend- exposure to these rays may re- t in death.

ELTER CONSTRUCTION

The following table shows the ckness of various materials re- red to reduce gamma penetra- from fallout by 50 percent, ch could be incorporated into r shelter:

GAMMA RAY PROTECTION BY MATERIALS USED (To Reduce Penetration By 50%)

Iron or Steel	*0.7 inches*
Concrete	*2.2 inches*
Brick	*2.0 inches*
Dirt	*3.3 inches*
Ice	*6.8 inches*
Wood (Soft)	*8.8 inches*
Snow	*20.3 inches*

time you double the thick- of the materials, you cut the etration of radiation by another percent. The thicker the walls, better your protection.

hen constructing a shelter, it in an area where you can in food, water, and possibly truct a signal. Just remember pend as little time as possible sed to radiation. Any type of ection is better than nothing ll, and it is imperative that seek shelter quickly. A unique about radiation shelters is a roof is not mandatory; how- it will offer some protection during a long duration survival stay from alpha and beta radiation. Depending upon location and wind direction, you may need the shelter for as long as two months. If you have a radiac meter packed in your survival kit, use it to determine the amount of radiation present. If you do not have one, consider the area to be dangerous and take proper precautions.

EXPOSURE TIME

Once inside your shelter, you should properly store any survival rations you were able to save. Make sure that all contaminated objects are kept away from this area. If you were unable to save any survival rations, you will probably begin to wonder how long it will be before you can go outside of your shelter and search for food and water. The following timetable will provide you with the protection necessary to avoid a serious dosage of radiation:

a. If it isn't necessary to leave your shelter for the first week, don't. Maintain complete isolation until four to six days after the last explosion. If you must leave your shelter to procure food or water, you may do this on the third day, but for no more than 30 minutes.

b. On the seventh day. one exposure of not more than 30 minutes.

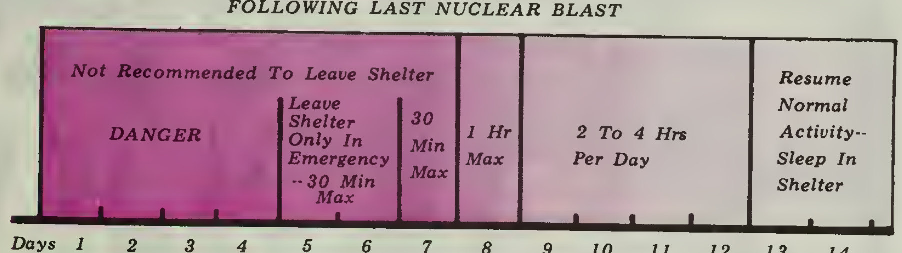
c. On the eighth day. one exposure of not more than one hour.

d. From the ninth day through the twelfth day, exposure of two or four hours per day.

e. From the thirteenth day on, normal operation, followed by rest in a protected shelter is the recommended procedure.

If you are unable to remember the above table, here is another approximate rule you can use. Radioactivity decreases tenfold for every sevenfold increase in time. Thus, after seven hours, the intensity of radiation will be one-tenth that of the first hour; after 49 hours, it will be one one-hundreth, and so on. At the end of two weeks (343 hours), it will have dropped to one one-thousandth of the first hour.

FIGURE 1. TIME TABLE FOR RADIATION SHELTER FOLLOWING LAST NUCLEAR BLAST



REMEMBER: Radioactivity decreases tenfold for every sevenfold increase in time.

NUCLEAR SURVIVAL continued

WAITING IN THE SHELTER

As you can see, most of the first thirteen days of your survival episode will be spent inside your shelter. Many people become very upset and nervous if they have to stay cooped up inside an enclosed area for any length of time. You should try and get as much rest as possible and do small amounts of exercise to maintain muscle tone. The exercise periods will be determined by the amount of food you are able to consume. Hopefully, you will be in good physical condition before you start your mission. You should plan what you are going to do outside when the thirteen days of shelter time have ended.

WATER AND FOOD PROCUREMENT

Once you begin to leave your shelter, try and replenish your water and food supplies. Depending on your location, there are several water sources you can use. Try to use water from springs, wells, or other underground sources. If you have snow, use the snow located six inches or more below the surface. Water from rivers and streams will be comparatively free from fallout within several days. In the meantime, you might boil some water and condense the steam. The radioactive materials will remain in the bottom of the containers. Purify and filter all water using a simple filter made from sand, rocks, grass, or any other suitable materials.

For food, remember any item (sealed) in a metal container is the safest to eat. If not available, you can use animals as long as you skin them and throw away all internal organs. Do not cut the meat off closer than ⅛ inch to the bone and be sure to cook it if possible. Eggs are also a good food source, but all milk should be avoided.

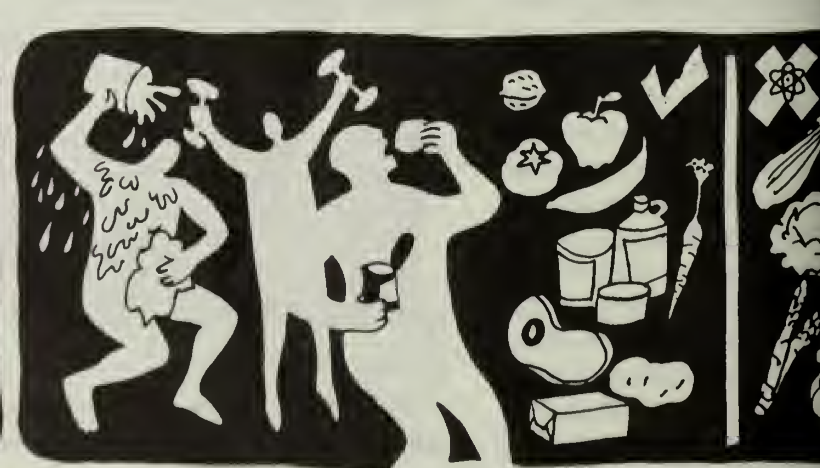
If animals are not available, you should take advantage of plant foods. The best choice would be vegetables such as potatoes, turnips, and carrots, whose edible portions grow underground. Your second choice should be those plants with a smooth skin or shell which can be removed such as bananas, apples, and tomatoes. Be sure to wash these fruits or vegetables thoroughly. Plants with a rough outer surface such as lettuce, broccoli, or cabbage are difficult to decontaminate by washing and should be considered as your last choice.

HYGIENE

The same care that goes into filtering water and selecting non-contaminated food should b corporated into personal hy practice. It is important tha keep as clean as possible du nuclear experience by keepin decontaminated material in shelter and burying any h waste or contaminated ma Wash yourself thoroughly ever possible and use decor nated water. As long as yo keep the body healthy, you a much better chance of c with any situation that might during your survival episode

As a potential survivor, help considerably to use pla common sense when dealing nuclear survival problems. must deal with the proble hand and solve it before you ceed. It will be much easier t vent the problem than to tr Remember to locate your s as quickly as possible, watch food and water closely to sure they do not become co nated, and keep yourself Above all, be patient. Try learn all you can about survi a nuclear area. It could save life.

Questions and comments cerning the information cont in this article should be ref to 3636 CCTW/DOTO, Fai AFB WA 99011, AUTOVON 5470. ★



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STATES AIR FORCE

Well Done Award

esented for
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ant contribution
to the
States Air Force
dent Prevention
Program.

FIRST LIEUTENANT
Charles L. Ogle

CAPTAIN
John D. Parr

492d Tactical Fighter Squadron

On 12 September 1977, Captain Parr and Lieutenant Ogle were leading a flight of two F-111F aircraft performing low altitude, terrain following flight. At approximately 500 feet AGL, the crew felt and heard a loud explosion accompanied by an abrupt yaw and pitch-up. Automatic Terrain Following was terminated and counter controls applied to arrest the uncommanded maneuver and recover to controlled flight. Captain Parr initiated a climb, turning toward an unpopulated area in anticipation of possible ejection. Within seconds, the left engine fire light illuminated directing attention to the left engine instruments. These indications confirmed a fire, and the crew began applying emergency procedures. The explosion had been so violent that checklists and debris were strewn throughout the cockpit. The left throttle was jammed in full afterburner position precluding normal bold face procedures. Captain Parr and Lieutenant Ogle decided to shut down the engine with the fire pushbutton and then activated the agent discharge in an attempt to extinguish the fire. Captain Parr declared Mayday on guard while simultaneously directing the rejoin of his wingman and turning to the nearest suitable airfield. The fire continued for approximately 2 minutes and was confirmed by Hid 14, his wingman. Additionally, Hid 14 reported a 5-by-8 foot hole on the left aft side of the aircraft with a large charred area streaming behind it. After accomplishing a controllability check, the crew prepared for landing. The lack of spoiler brakes due to the stuck throttle severely hampered stopping capability. This problem was compounded by a short runway and the higher single engine approach speed. Captain Parr executed a flawless single engine landing. The timely and decisive actions of Captain Parr and Lieutenant Ogle during an extremely critical inflight emergency prevented possible injury or loss of life and resulted in the safe recovery of a valuable aircraft. WELL DONE! ★


UP AHEAD?...OH NO! WHAT EVERY PILOT DREADS!
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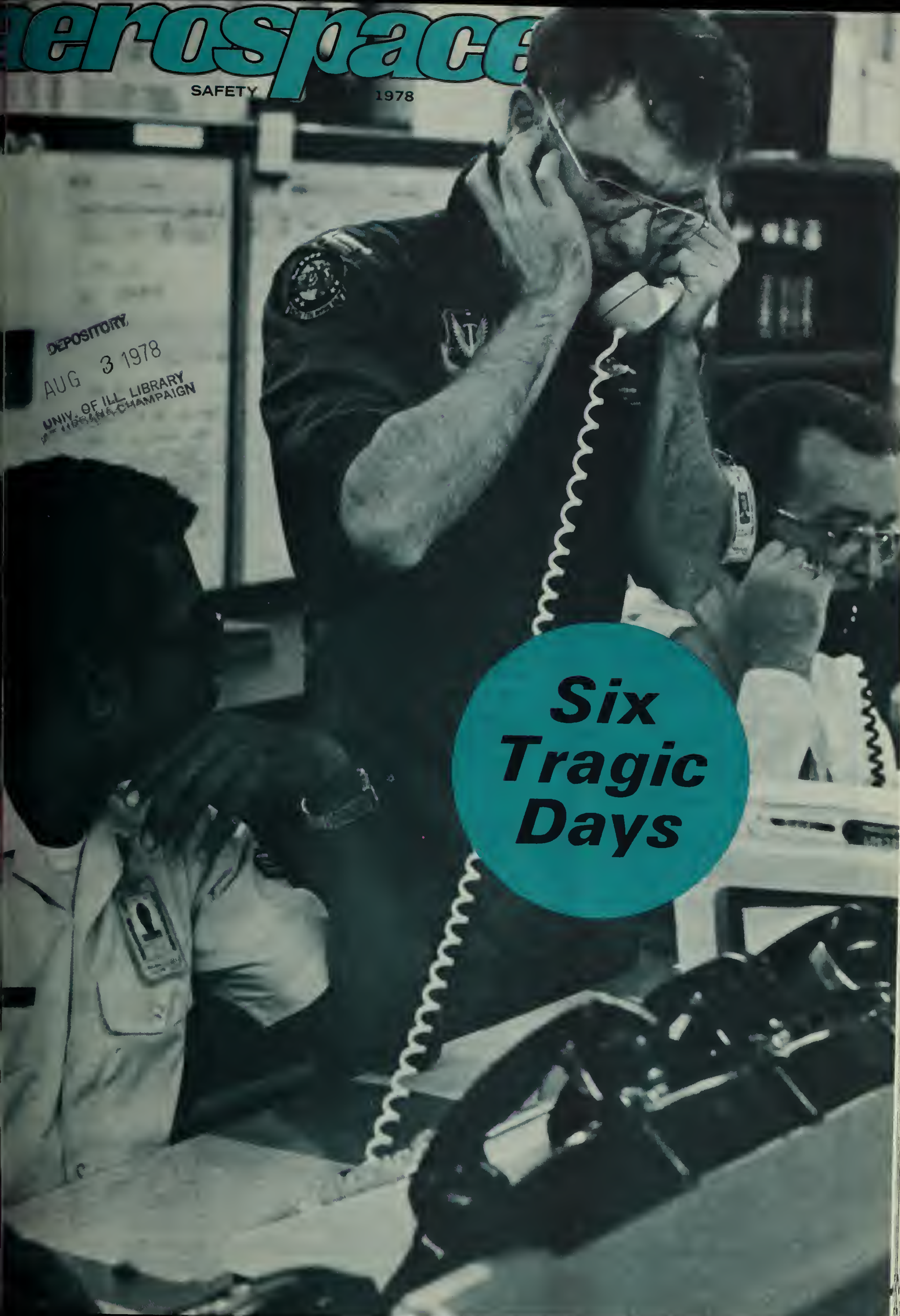
CAW
CAW
CAW
CAW!
STARLING IN THE INTAKE!
MACNELLY 10/7

aerospace

SAFETY 1978



JULY 1978

UNITED STATES AIR FORCE

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, '

JULY 1978 AFRP 127-2 VOLUME 35 NUME
Vol. 34

a tragic six days

the southwestern desert is a omewhat triangular mountain ange. The highest point of this ge towers 8,000 to 9,000 feet ve the surrounding desert floor. long canyon approaches to this can appear deceivingly gentle can leave an impression that environment is permissive for , low performance aircraft op- ions.

During a 6-day period, the moun- s claimed four destroyed air- , five lives, and six injuries. of the aircraft and one of the ities were civilian. The follow- is a synopsis of the events of 6 days.

AY ONE: An O-2A, call sign 14, took off VFR at 1355 for a planned forward air con- mission with a flight of F-4s. last radio contact was 11 tes later. Radar contact was 5 minutes after that. When the did not check in with the controller at their planned t time (1445), an intensive air ground search was begun.

AY TWO: An air search in- ing HC-130s, UH-1Ns, HH- O-2s, OV-10s, and civil air- continued. Neither the air nor the ground search was successful.

DAY THREE: The search continued with no success.

DAY FOUR: The search continued. That morning, an Air Force lieutenant colonel and his son, in a rented single-engine private aircraft, were scouting for camp grounds in the area. When they failed to return, they were added to the objectives of the search. That evening, photographic interpreters identified a suspect area.

DAY FIVE: An O-2A with two pilots on board was launched to investigate the suspect area. They checked in with the airborne control post at 0759. At 0814, they called, "established in the search area." At 0900 they responded to a routine operations check. At 0910 they failed to respond to an attempted radio contact. At 0930, the airborne command post initiated a radio frequency check. The airborne search was again expanded.

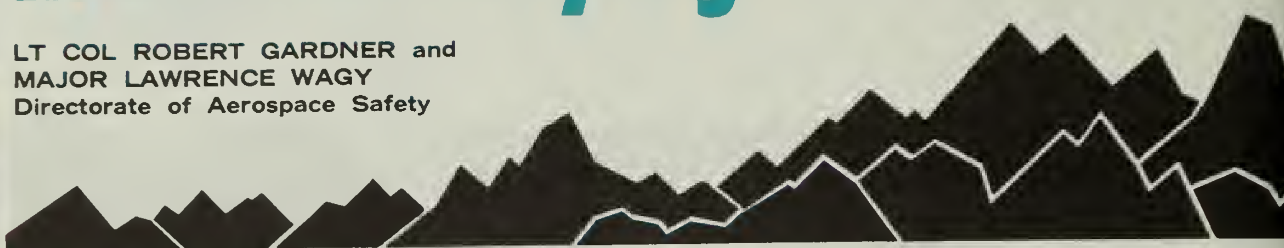
DAY SIX: A ground search party discovered the wreckage of the O-2A lost on Day 5. The crash site was in a canyon at the 8,000-foot level. Both crew members were dead. Two helicopters were directed to the crash site. The pilot of the lost civil aircraft, who had been walking in the snow since the morning of Day 4, saw the activity near the O-2 crash site and walked to it. He stated that his son was in the wreckage of his plane, badly injured. One helicopter evacuated the survivor; the other a UH-1N, continued to search for the light aircraft. That helicopter crashed while flying upslope backtracking the father's trail in the snow.

EPILOGUE: THE CRASH SITE OF THE O-2A LOST ON DAY 1 WAS FOUND LATER IN DAY 6. BOTH CREW MEMBERS WERE DEAD. THE HELICOPTER WRECKAGE WAS FOUND THAT SAME DAY. ALL FIVE PERSONS ON BOARD RECEIVED VARYING DEGREES OF INJURY. THE LIGHT CIVIL AIRCRAFT WAS FOUND 2 DAYS LATER. THE PILOT'S SON DID NOT SURVIVE. THIS EPISODE PROVIDES LESSONS IN MOUNTAIN FLYING AND SEARCH AND RESCUE PROCEDURES AND TECHNIQUES. THESE TWO SUBJECTS ARE COVERED IN THE FOLLOWING ARTICLES.

a tragic six days • part I

Mountain Flying

LT COL ROBERT GARDNER and
MAJOR LAWRENCE WAGY
Directorate of Aerospace Safety



The combination of high terrain and environmental conditions significantly affect light aircraft performance. These conditions, when coupled with deceptively permissive terrain and the urgency of search and rescue, set the stage for this tragedy. The sequence of mishaps during that 6-day period illuminates the hazardous nature of mountain flying in light, low performance aircraft. These hazards can be minimized by a thorough knowledge of proven mountain flying techniques. The following are just a few of the more basic of those techniques.

Weather hazards in mountainous terrain can be extremely localized. Even when your route of flight is forecast to be relatively clear, very localized storms and hazardous winds can exist around mountain ridges, peaks and canyons. Storms and localized precipitation are, in a sense, less hazardous because they are easily seen and avoided. Localized wind hazards on the other hand are subtle and can trap you with little warning. Steady state winds can double their velocity when crossing a mountain ridge (see figure 1). This can have a significant effect on a low performance aircraft's ability to climb and clear the ridge from the downwind side because of turbulence and downdraft. A light aircraft crossing this ridge from the upwind side with minimum altitude clearance can be sucked down by the downdraft and turbulent air into the backside of the ridge.

When crossing a ridge, the flight path should be 45 degrees to the ridgeline (see figure 2). As the ridge is approached, the pilot should expect to see more and more of the terrain on the other side. This means that, u less a severe downdraft is en countered, the aircraft will cl the ridgeline. If it is not appa that the ridge will be cleared safely, the 45 degree cut wo require a shorter turn to abort the attempted crossing.

Flying parallel to the ridge line on the upwind side will be smooth with updrafts to add your climb performance. If yo must parallel on the downwin side or cross a ridge, keep e altitude to stay out of downdr

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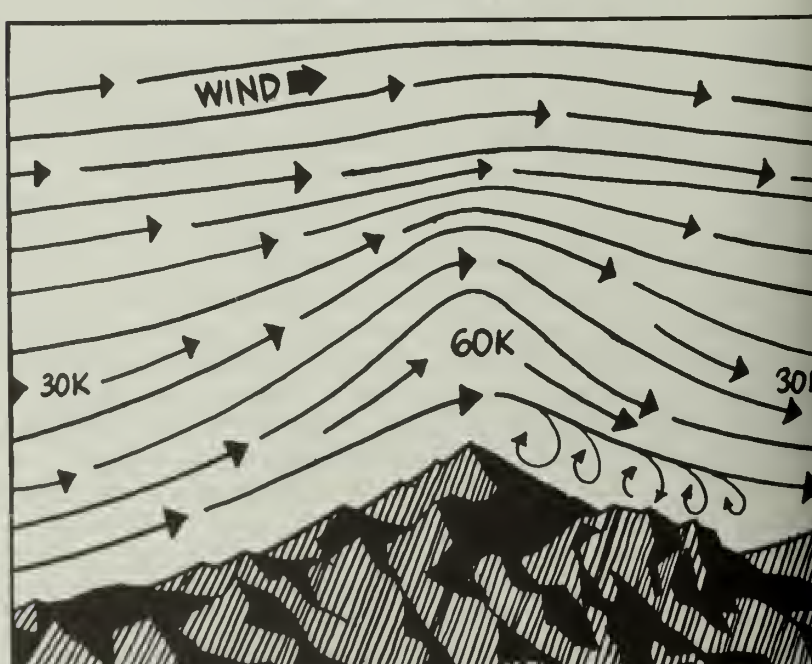
Figure 1. A steady wind speed can double over a ridge.



tragic six days • part II

The Search For SPAR 14

LONEL FRANK R. JENKINS
4th Tactical Fighter Wing
llis AFB NV

recent times, most Air Force ircraft, missing over land, have een found within 24 hours. trend toward larger aircraft, ng completely under radar trol and equipped with emer- cy beacons has eliminated necessity for large area ches. Well, almost. There are some Air Force aircraft oper- g under VFR, at altitudes make radar tracking inter- ent, at best, and with enough to make it to the next state re someone realizes they overdue. This was the case Spar 14; it was operating in mountainous terrain below 500 feet AGL. The searchers were aware that both pilots were new to the area, and with over 4 hours of fuel remaining they could have covered a lot of ground.

This led to a massive effort. By the fifth day, the entire search encompassed an area of over 5,000 square miles and over terrain that varied from desert (including portions of Death Valley) to a snow-covered 12,000 foot mountain. Over 50 USAF and CAP aircraft were involved. In addition to aircraft, heli- copters and ground search par- ties were provided by local sheriff's departments. There are lessons to be learned from the search for Spar 14 that can be used when such an effort again becomes necessary.

The responsibility for finding a missing aircraft rests with the nearest installation, so even if none of your base aircraft has less than four engines, you might find that your command post is suddenly deeply involved in looking for a small aircraft for the simple reason that its last known position was in the vicinity of your field and the Aerospace

continued on page 5

Investigators, right, probe wreckage of one of four crashed aircraft.

A Tragic Six Days • Part I

Mountain Flying continued

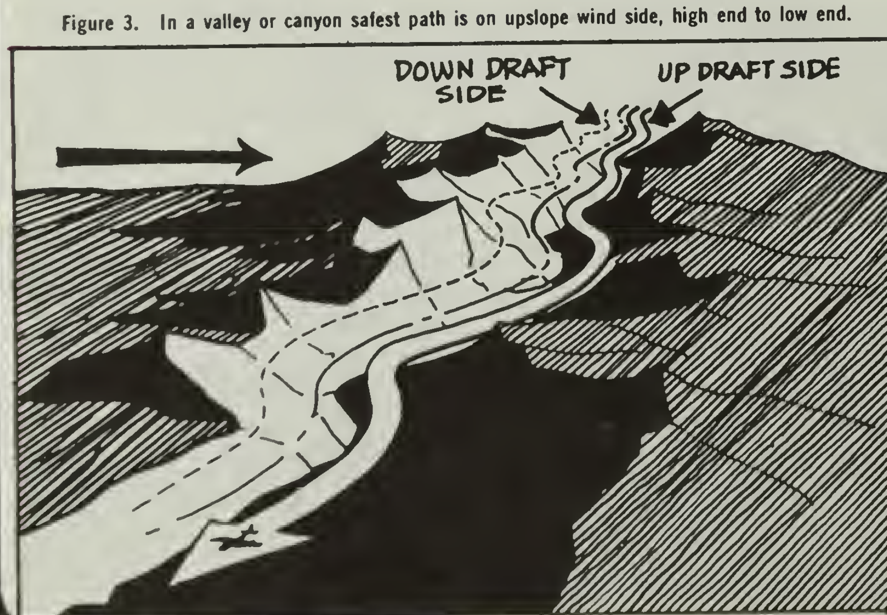
Figure 2. 45° approach to ridge provides pilot several options.

Some pilots use a "rule of thumb" of 1,000 feet clearance with calm wind and another thousand feet for each 10 knots of wind.

When flying through a canyon, fly close to the side of the canyon which affords an upslope wind. This provides additional climb capability and will give you more room to reverse course (into the wind). If low level flight through a canyon is required, fly down the canyon, not up.

Due to the constantly changing conditions of mountain winds, a pilot should be prepared to encounter downdrafts. If you do, don't panic, keep the nose of the aircraft down and maintain

Figure 3. In a valley or canyon safest path is on upslope wind side, high end to low end.



your airspeed. The object is to fly out of the downdraft, not t counter it by raising the nose.

Density altitude is the key to performance. For example even though a ridgeline peak 8,000 feet mean sea level, the pressure altitude at the peak could be 8,500 feet on a given day. With an outside air temp ture delta of +10 degrees c grade, the density altitude w be 10,000 feet. The aircraft engine cannot read maps, can very accurately read den altitude. A light aircraft (not super-charged) with a standa day sea level rate of climb of 500 feet per minute could e a standard day rate of climb 155 feet per minute at 8,00 feet MSL. On this particular however, a 10,000 foot dens altitude would result in a ra climb of 130 feet per minute Another factor in engine per ance is relative humidity. H relative humidity can result i significant power loss.

Turn rate (more exactly r of turn) can be critical in mo tain flying. It is totally depe upon bank angle and true a speed. Using the 8,000-foot ridge example, assume a pilo is climbing a canyon to cross that ridge. He is climbing a 100 kts CAS and is limited stall speed to 60 degrees o bank. At sea level (standard day) his true airspeed would 100 kts and his turn radius feet; but with a density alti of 10,000 feet, his true airs would be 117 kts and his radius would be 690 feet. If canyon is 1,200 feet wide a is flying up the middle, he h better hope he can top the

Helicopter pilots face the same basic mountain flying lems as the fixed wing pilo

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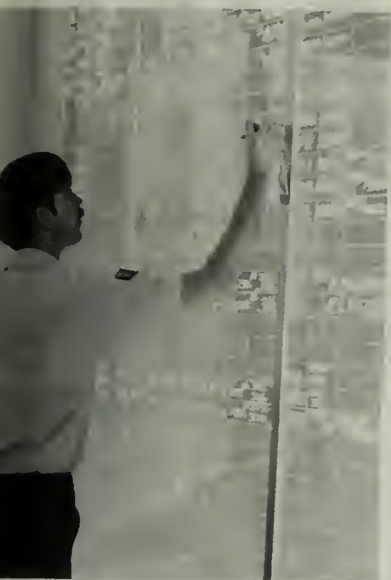


ping track of search aircraft. More than 50
F and CAP aircraft participated in search.

nd Air Force participants study map of
area.

A Tragic Six Days • Part II

The Search For Spar 14 continued

Rescue and Recovery Service has requested that your base organize the search. Hopefully, your base will have some sort of established SOP including a checklist to be followed in such cases. But if after the routine things have been done (communications search, ramp check of local airfields, sweep of the area with available aircraft), there is still no sign of the little fellow, you had better call for assistance. Your first call should be to the Air Force Rescue Coordination Center.

The AFRCC at Scott AFB are the pros of the business. They can give you good advice. send you some SAR controllers to help organize the chaos in your command post, dispatch HC-130s and Jolly Green's, obtain Coast Guard assistance, and so on. One of the first units they will send you is the Air Force's own.

Civil Air Patrol There is a CAP Wing organized in every state. These volunteers are well-trained in search techniques, equipped with slow moving light aircraft, and highly experienced (they fly 80% of all inland SAR flying time). Special Air Force funding reimburses them for the gas they burn while on a search, but they provide everything else; the aircraft, pilots, observers, maps and a coordinator to work in your command post. Some other resources you might consider obtaining are:

Photo Reconnaissance Both active and reserve force photo recce aircraft can be called on to look in places where visual observers can't. If they arrive on scene soon enough, aircraft equipped with infra-red sensors may detect the location of the missing aircraft by spotting a hot engine.

Local Law Enforcement Particularly in rural areas, sheriff's departments are well equipped

continued on page 21

Search director, Col Frank Jenkins, studies chart with staff while directing search for missing aircraft.

JP-8 IS COMIN

MAJOR PHILIP M. McATEE
Directorate of Aerospace Safety

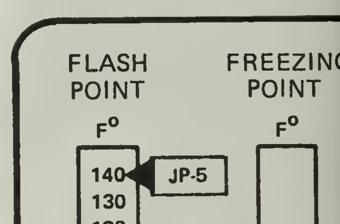
The proposal for the Air Force to convert from JP-4 to JP-8 fuel has been researched and discussed for the past several years. Now the day is coming. Beginning this summer, JP-8 will be introduced in the United Kingdom (U.K.) by the F-111E equipped 20 TFW at RAF Upper Heyford. All other wings in the U.K. will begin using it during 1979.

Why are we switching to JP-8? To see, let's review some background.

When there is an aircraft accident, a high probability for fire exists. Fire is even more common from battle damage. Because of this combat fire danger, Tactical Air Command requested, in 1967, that a fuel be found less susceptible than JP-4 to fire and explosion. Any fuel selected had to be a hydrocarbon fuel with required availability, reasonable cost, and suitable physical and chemical properties, to permit direct utilization in operational aircraft without extensive modifications or serious degradation of aircraft performance.

The majority of candidate fuels such as Jet A and Jet A-1 used by commercial aviation or JP-5 used by the US Navy are kerosene based. JP-4 and Jet B are fuels made by blending naphtha with kerosene. (Original JP-3 fuel was a mixture of gasoline and kerosene, and JP-4 is really just a lower vapor pressure JP-3.) All of these fuels have different characteristics, and both good and bad points.

- JP-4 or Jet B is a wide cut mixture of heavy naphtha and kerosene with a vapor pressure of 2-3 psi, a freezing point of $-72°$ F and a very low flash point of only $-20°$F. The relatively high vapor pressure and low flash point permits easier light-off at low temperatures, but also



has made JP-4 frequently the cause of post crash fires. With only minor changes, it has been the standard Air Force jet fuel since 1951. JP-5 was adopted by the US Navy in 1952 as their standard fuel due to the need for a less hazardous fuel for shipboard use. It has a minimum flash point of 140° F. Navy aircraft have higher power ignition systems to permit better cold weather starting with the higher flash point fuel. Because of the restrictive specifications, production of JP-5 is limited, and the petroleum industry could not support an Air Force change from JP-4 to JP-5.

Jet A or Jet A-1 is the standard for commercial airlines. Jet A has a −40°F freezing point with a flash point of 105°F and a vapor pressure of only 0.1 psi. Jet A-1 has the same properties, but a lower freezing point of −58° F. The high freeze point of −40°F for Jet A makes it unsuitable for USAF use and, in fact, most commercial aircraft use Jet A-1 for this same reason.

JP-8 (NATO F34) is Jet A-1 with anti-ice and anti-corrosion inhibitors added. It is available from all sources that make commercial Jet A-1 fuel including European refineries.

though safety was the first deration in finding a substi- for JP-4, other reasons for ging have appeared. As we JP-4 is 50 per cent naphtha is being used more and for industrial purposes, in- g the manufacture of synthe- tural gas. This increased de- for naphtha is causing the price to soar, and the cost advantage of JP-4 will soon be gone.

Also, both the United Kingdom and France are already using JP-8 (NATO F34) and Italy is converting now. At the present time, only the military uses JP-4 in Europe, and during wartime we would have no back-up source of supply. But with JP-8, commercial jet A-1 fuel is available worldwide. Within NATO, one standard fuel should be adopted for inter operability, and it appears both the nations concerned as well as European manufacturers prefer JP-8.

So, as you can see, JP-8 quickly became the prime candidate for a replacement fuel. It has a much higher flash point than JP-4 (therefore is less susceptible to ground ignition), excellent availability, and is a common alternate fuel for many of our aircraft at the present time.

Like all things in life, all is not gold. Because of the higher flash point and lower vapor pressure (which makes it safer) JP-8 makes cold weather starting more difficult. Since the flash point of JP-8 is midway between JP-4 and JP-5, the properties are also midway between the two. Testing has shown that high altitude relight capability has proven not to be a big problem. At higher altitudes restart times have increased, but with no decrease in restart capability. Ground starting in extremely cold temperatures with JP-8 will be a problem that still needs to be solved.

However, all testing to date has shown few difficulties, and most of our aircraft and engines are already qualified on kerosene fuel as an alternate. Continuing testing will qualify aircraft on JP-8 as primary fuel and recommend necessary modifications that will differ from aircraft-to-aircraft.

Also, for a period of time, we will have both JP-4 and JP-8 being used within Europe. This will require new technical data on performance to cover four possible situations.

- JP-4 trimmed aircraft fueled with JP-4.
- JP-4 trimmed aircraft fueled with JP-8.
- JP-8 trimmed aircraft fueled with JP-8.
- JP-8 trimmed aircraft fueled with JP-4.

After JP-8 is proven operationally feasible at U.K. bases, the European continental bases will convert during the 1980 time frame. The Department of Defense has already directed that all new jet engines must be qualified on both JP-8 and JP-4.

So, the day of JP-8 is here, and with minor changes we won't know the difference. ★

JP-8 jet fuel joins the fleet in F-111s in the U.K. this summer. JP-8 is Jet A-1, standard commercial jet fuel, with anti-ice and anti-corrosive additives.

USAF WIND SHEAR CONFERENCE

CAPTAIN JAMES J. LAWRENCE • Directorate of Aerospace Safety

The concept of low-level wind shear is by no means new to the aviation community. In fact, a quick review of **Aerospace Safety** magazine issues in the early 1960s revealed several fine articles on the phenomenon. Why then, all the recent interest and publicity on a subject that's been around for so long? Aviation safety periodicals have published pages and pages of information on the causes and effects of the wind shear problem. The FAA and NTSB have put out reports with in-depth analyses on the subject. The USAFIFC has developed a wind shear road show briefing that has reached many aircrews. And, finally, the Air Force and major commands saw fit to send representatives to a Wind Shear Conference held in May at Travis AFB.

The answer is inherent in the fact that one even has to ask the question. The magnitude of the hazard caused by a severe loss of head wind or tail wind on an aircraft in landing or takeoff phase is just not understood well enough by USAF aircrews. Those who do understand the hazard are not equipped with the knowledge and training to avoid or cope with the situation.

Addressing these two problems was the charter of the USAF Wind Shear Conference, hosted by the Military Airlift Command and sponsored by the Air Force Inspection and Safety Center. The hazard surely exists and has been highlighted in recent years as a causal factor in several civilian commercial carrier mishaps. Their use of sophisticated flight data recorders has permitted the identification of aircraft performance deficiencies experienced during a wind shear encounter, which placed the aircraft in a situation from which the pilot was not able to recover. Few USAF aircraft are so equipped, but the profiles of several mishaps fit the description of wind induced problems.

The Wind Shear Conferen tracted standardization, simu training, ground training, weather people from the commands. The purpose wa first establish the hazard i minds of those who have the est ability to get the word t aircrews. Secondly, discuss means for creating an Air education program, and last answer some fundamental tions on coping with a wind condition.

The agenda included pres tions by the Federal Aviatio ministration, the Air Weather vice, the Instrument Flight Ce and the Inspection and Safety ter as well as the personal ex ences of various military and mercial pilots. Once the wo group had a good backgrour the causes and identification low-level wind shear encou

ıch participant took a ride in the ımputer-generated visual display 5 or C-141 simulator. There, e actual profiles of wind shear- used mishaps were flown, and the majority of cases, the re- lts were disastrous. The impact experiencing the problem sup- emented by the visual reinforce- ent of the crash or near-crash, nds to make one a true believer.

The attendees were also divid- into four seminar groups, each sponsible for working several oblems in their areas of exper- e. The goal was not so much to ıke decisions as it was to enlist mmand support for, and brain rm the development of a USAF nd shear training program. It pears that a many-sided ap- oach is envisioned, which will lude a basic aircrew wind shear ıcation film, wind shear training ing UPT, aircraft initial qualifi- ions and upgrades, emphasis ing flight evaluations, and wind ar sections in aircraft tech or- s. A full media approach with nmand support appears to be direction in which best to pro- d.

Vind shear, like so many other ards, has got to be kept in per- ctive. A DOT study of almost 000 aircraft accidents from 4-1975 revealed only 25 that ained a distinct possibility of d shear involvement. It is esti- ed that violent, severely haz- us wind shear will be experi- ed in only one of five pilot ers. Less severe wind shear. ever, is a fairly common oc- ence. Like so many other as- s of professional aviating, this rd must be understood and tifiable so that the USAF pilot make intelligent decisions to re the safety of his or her air- . Your local safety officer ld be able to supply you with ifics on the causes and dan- of wind shear encounters. ★

DISCIPLINE WINS WARS

MAJOR E. E. "GENE" McVAY
188th Tactical Fighter Group
Ebbing Air National Guard Base
Municipal Airport, Fort Smith, Arkansas

The winning team in college basketball last season had the word "discipline" written on their practice uniforms. Discipline wins ball games and discipline wins wars. Conversely, the lack of discipline can lose wars and cause unnecessary losses during peacetime. One cause in many accidents today is lack of discipline.

The application of discipline is well understood as it relates to cadets and ground soldiers. Even as it relates to children and pets. But what about the combat aircrews? Using good discipline does not indicate weakness, nor does it in any way degrade mission accomplishment. Having the discipline to press the attack or knock it off as necessary is the mark of leadership.

Wingmen or crew members won't attempt irresponsible acts unless they believe they can get away with them. These acts reflect directly on the flight leads and aircraft commanders. If you don't demand discipline, you probably won't get it.

Discipline is not something to impose just on wingmen, however. A recent accident resulted when a flight lead abandoned his flight after they were returning to base with bingo fuel. They were on a red flag mission and in the heat of battle, maybe he forgot for a moment that they were only training. That no one was shooting real bullets and that he could call time out at anytime by simply saying "knock it off." Stating that he had enough fuel for one more pass, the flight lead returned to the target area and possibly attempted to engage in dissimilar air combat against established rules. This breach of discipline cost a life, a valuable airplane, and much mental anguish.

Today's peacetime training is more demanding than ever before. There is less-and-less margin for error as planes go faster and more planes participate in exercises. Accordingly, crews must adhere to strict discipline to accomplish the mission safely. ★

Red Rain

CAPTAIN EUGENE J. CAISSE
Directorate of Aerospace Safety

During the past few years, forest and brush fires have ravaged large areas of the western United States, taking a heavy toll in property and lives. The US Forest Service, along with the various state agencies charged with forest fire control, has recognized the value of aircraft to help spot danger areas and to apply chemical fire retardant. The Forest Service, through a contract system, uses such aircraft as the DC-6, DC-7, C-119, B-17, and several types of helicopters to dump chemicals on hot spots and fire breaks. A common deficiency of these aircraft is that they all use a dispensing system that simply dumps the chemical in one glob. They cannot distribute it evenly over the fire area.

The Air Force, seeing that th must be a better way, has taken t initiative to develop a new technique for applying the chemical fire retardant. One of the Air Fo flying units involved in this proj is the 146th Tactical Airlift Win California Air National Guard. During the past few fire seasons, Colonel Russ Penland and his flight crews have developed tech niques in the use of a new typ

lispensing system which was de-
igned especially for the C-130
ircraft.

The new system involves equip-
nent which applies an even spray
f fire retardant over a well-defined
ectangular area. The Modular
irborne Fire Fighting System
MAFFS) was designed to be in-
alled in a C-130 aircraft in a few
ours. It is a completely palletized
ystem of storage tanks and asso-
ated ducting with two dispensing
ozzles which protrude neatly from
e open rear cargo hatch. A load-
aster sits on the pallet and con-
ols the pressurization of the tanks.
nlike the majority of conventional
e fighting aircraft which can
spense a maximum of 2,000 gal-
ns of fire retardant in a deluge,
e MAFFS can apply 3,000 gal-
ns evenly over an area 150 feet
de by 1,200 feet long. Since the
 Forest Service owns the MAFFS
d the Air Force provides the air-
ft and crews, both agencies are
ntly responsible for training in
 use of the equipment and the
ociated tactics.

Aircrew training is conducted in
 phases. All pilots and load-
sters attend an initial ground
ning class which is conducted
the Forest Service. They learn
est Service organization, com-
d and control, fire character-
s, wind effects, and tactics.
e they will become part of a
ly complex fire fighting team,
 must know a great deal about
nteraction of all the agencies
lved.

ight training is conducted by
lying units themselves. New
 members fly eight sorties
r the direction of squadron in-
tors and after initial checkout,
rews stay proficient by flying
 sorties per year. The training
ons, which simulate Forest
ce tactics, not only train the

Modular airborne fire fighting system allows dispersal of fire retardant evenly over a 1200'x150' area. System can be installed in C-130 in few hours.

flight crews, but also check the MAFFS equipment, which is constantly being modified and improved. Because of the high cost of the fire retardant (about $.90 per gallon), the 146th TAW crews use red-colored water on their training sorties.

When the Forest Service is fighting a fire, it first uses the commercial aircraft from the flying services with which it has contracts. When all of these aircraft are committed to covering fires, the Forest Service can request assistance from the Air Force through Forest Service command agencies. The Airlift Readiness Center at the Pentagon determines which unit will assist the Forest Service, and HQ MAC tasks the unit through normal MAC command and control channels. The unit will usually stage from an airfield close to the fire scene where they may stay for weeks depending upon the extent of the fire.

Once the unit is in place at the staging base, bright orange paint is applied to the aircraft nose, wing tips, and vertical stabilizer. The unit also paints large orange numbers on the aircraft for identification. The C-130's camouflage paint job makes these aircraft difficult to see, especially through smoke and haze. The orange paint gives very good visibility under these conditions.

A typical mission involves multiple sorties. The close proximity of the staging base to the fire, and the MAFFS' short turn-around time, allow the crews to make many drops each day. A sortie involves two aircraft. The lead airplane is usually a Baron flown by a Forest Service crew. This lead ship spots the drop area for the C-130 and also leads the drop crew safely around wires, snags (large bare trees), and turbulence. As they approach the drop zone, the aircraft fly at 125 feet above ground level and 130 knots. The C-130 spreads its fire retardant evenly over the drop zone, which may be a burning area or a fire break.

One advantage of the MAFFS' ability to apply chemicals evenly lies in the area of rescue. When a fire fighter finds himself trapped by fire and must be rescued, the MAFFS can spray directly over his head, and he will not be injured. This cannot be done with any other system, because they dump the whole load at once.

The MAFFS system is undergoing constant improvement. The operational units are currently being modified so that they can selectively dispense only part of their load. Currently, all of the chemical agent must be applied at one time.

The Air Force's technological advancement of the forest fire fighting business may have come just in time. With the recent heavy rains in our western states creating greater-than-normal foliage, the 146 TAW MAFFS crews may be in very great demand this fire season. ★

During May of this year, we conducted no-notice evaluations of nine installations for the Rex Riley Transient Services Award. This trip was the first step in the revitalization of the entire program. A short summary of the evaluations follows:

Retained Awards:

OFFUTT AFB NE

Continues to be a good place to stop! Beware of heavy traffic periods and servicing of odd-ball types of aircraft; your turn time may be slightly longer. However, the TA folks are definitely trying. Quarters—good, food good during duty hours, machines during non-duty. Ramp space somewhat limited with some tight taxi space at times. Watch the X-winds and gusts between the buildings during landing.

MAXWELL AFB AL

An excellent turn despite shortage of people at times! Conscientious TA with fuel and service usually waiting when you arrive. If you plan to RON, make a reservation if you can to prevent staying in some pretty bleak SOS-type rooms. Transport—excellent; helpful, fast and courteous. Base Ops—well-run and oriented toward service. Best selection of machine food in the US (dubious distinction).

TYNDALL AFB FL

Continues to be a best-kept secret. TA folks are among the best in the AF. Obvious professional attitude provides the best service we saw this trip. Base Ops—efficient and well-run. Quarters and food availability above average. A super place to stop and/or stay!

SCOTT AFB IL

Short runway for some folks, but if you can get in, it's a good stop! Good service, quarters, food, and transport! What else can we say?

SHAW AFB SC

Another best-kept secret! Sh provided us with an excellent st over. Base Ops and TA reflec professional effort at good airc service. Despite being busy, t have their act together. Base aircrew facilities are among best we've seen. Base transp was responsive and quarters w excellent. Food availability g during duty hours, but same machine jungle if you are o quick turn.

MYRTLE BEACH AFB SC

Crowded ramp with only a transients, but an excellent s over. TA fast and conscienti with obvious concern for g service. Base Ops. billeting, food service were outstand Special note: Base Ops has on the last "real" snack bars in AF with super food. As m tioned, the transient ramp spac pretty limited, so it might be w a call ahead if you're drivin

ig machine and/or planning to
ON.

NO CIGAR: We're not going to
ame the places that were re-
oved or not added to the Rex
iley list, but we feel that some
eneral comments might help. If
e shoe fits. . . .

• Base X—Although a 24-hr
ansient services base (not many
these left), this base was defi-
tely **not** transient oriented! The
se Ops complex was dingy with
aircrew lounge (or even a chair)
cilities. Flight planning room
orly lighted and missing FLIP
blications. Basically a hassle.

• Base Y—Another 24-hr tran-
nt services base also not ori-
ted toward strangers. Follow me
ck wouldn't come out to meet
Pax service sent no wheels
spite a filed code 7 on board.
se Ops and WX folks seemed
not really have much time for
since we weren't from the home
me or didn't have VIP's on
rd.

• Base Z—Despite a brand
ops facility, this base also
e extremely poor service to
nsients. Long fuel delays, non-
ng TA folks and phantom Base
personnel made a 2-hour turn-
und seem like a real effort.
eral lack of concern.

Common to X, Y, and Z—
oping apathy! Anyone who has
n flying or riding military air-
t for awhile has seen the base
doesn't really seem to care
ther you get good or bad ser-
No pride in their operation;
folks putting in time.

OND FAREWELL: This month
re dropping Richards-Gebaur
from our list due to their
ual loss of transient facilities
ed to draw-down and closure.
TA and Ops folks at R.G. have
ys enjoyed the reputation of
providing fast, efficient, and conscientious service. We in the airplane business are sorry to see them go, for good stopping places are hard to find!

Hopefully, the Rex Riley Transient Services Award program is now back on its feet. We intend to visit bases within every 2-year period in order to retain some "currentness" to the award. After an evaluation visit, the installation commander will receive a letter with a copy of the write-up checklist and a new certificate (if applicable). Keep in mind the intent of the program: to prevent mishaps through the improvement of transient aircrew facilities and transient aircraft servicing and maintenance. One bad link in the chain breaks it! For instance, Base Ops and TA can be doing their job, and if billeting doesn't provide a place for the aircrew to get decent crew rest, the evaluation will be unsat! Conversely, the quarters can be great, but if TA gives a bad turn, the award won't go (or stay) at that installation. We are trying to give everyone an honest shake and although we still have some problems with the program, we feel that we're moving in the right direction.

One last pitch! We are limited in the number of evaluations we can give, so we depend on aircrews and installation personnel to furnish us with info. AIRCREWS—if you get a bad or good deal somewhere, let us know. Fill out a transient aircrew form and send us a copy. Installation personnel—if you're not currently on the Rex Riley list and you feel like you have your act together, let us know. We'll try to get by and give you a check! Send all correspondence to: Rex Riley, c/o AFISC/SEDAK, Norton AFB CA 92409. Thanks for your help! ★

THE

REX RILEY
Transient Services Awara

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
ENGLAND AFB	Alexandria, LA
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AL
PETERSON AFB	Colorado Springs, C
RAMSTEIN AB	Germany
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
TORREJON AB	Spain
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
NORTON AFB	San Bernardino, CA
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
CARSWELL AFB	Ft. Worth, TX
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayetteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND

TANK TALK

Gear up . . . flaps up . . . and you suddenly see the right and left fire warning lights staring you in the face, followed by two overheat lights. The end of the world? you say. Well, not necessarily. It's certainly justification for that moment of panic or queasy feeling in the pit of one's stomach that everyone encounters at one time or another. While a double fire light could be caused by many things, records reveal that one F-4 is lost every 12-18 months on takeoff due to a leaking external centerline fuel tank. The Dash One even has a discussion comment to this effect after the bold face emergency procedures for fire on takeoff: "A leaking centerline fuel tank may cause dual engine fire/overheat indications."

The sequence of events for such emergencies varies from incident to incident; but usually, once the gear is retracted, the centerline tank pressurizes automatically, any leak present starts leaking under pressure, and the fuel being sprayed out is ignited by the afterburners on takeoff. The fire warning lights normally illuminate within seconds and are often followed by overheat lights.

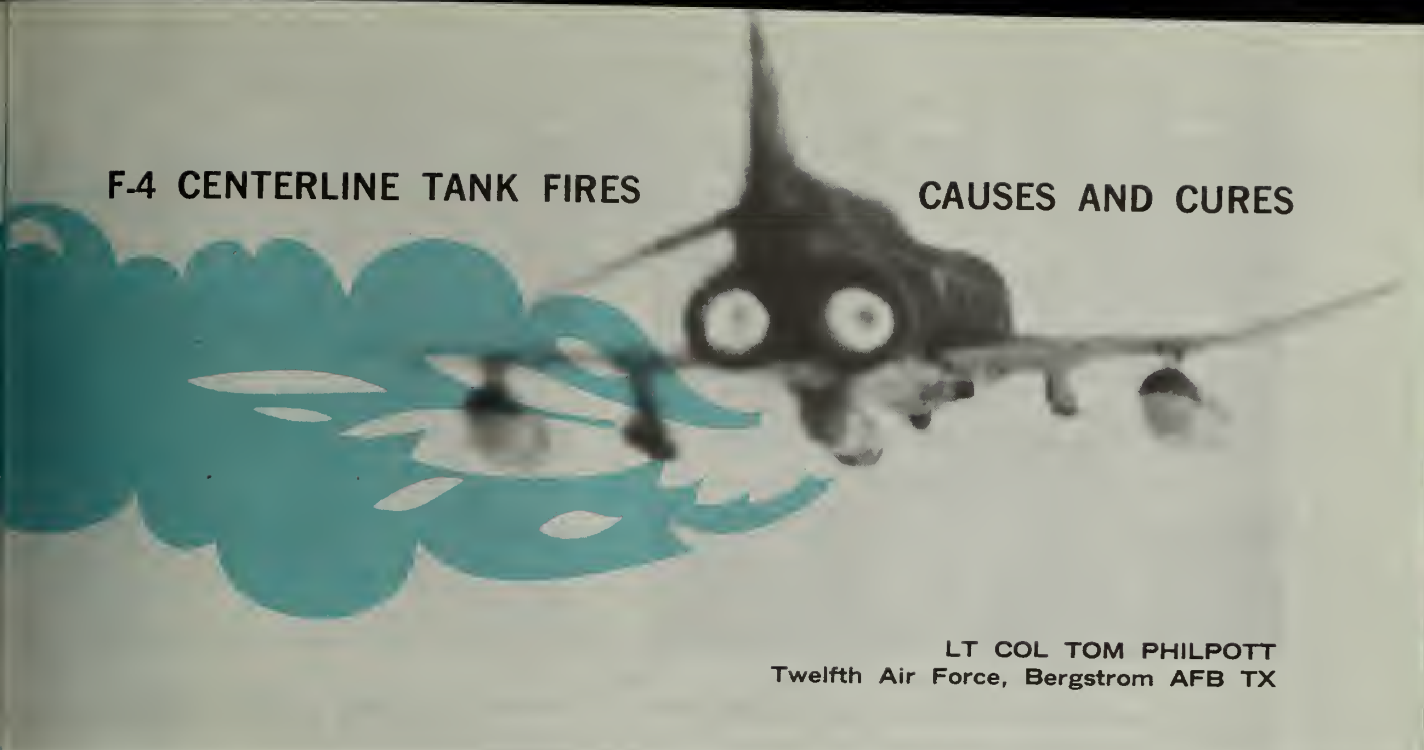
The solution, of course, is simple and spelled out in the second bold face step for fire on takeoff, "External Load-Jettison." With the fuel source removed, the fire will normally be terminated, and a successful recovery can be accomplished. Many crews have followed these procedures and experienced only minor damage, so one might be inclined to ask, "What's the problem?" The emergency is defined, covered in the Dash One and corrective bold face action outlined. Unfortunately, statistics show that five F-4 type aircraft have been lost in the past seven years due to centerline tank fires on takeoff. While no two centerline tank fire incidents were exactly the same in the five major accidents, there were certain similarities:

- The crews did not take actions to jettison the centerline tanks.
- The fires continued, and the crews subsequently lost control of the aircraft and ejected.

There are, of course, some circumstances in which jettisoning of the external fuel tanks would not be feasible, e.g., during takeoff over populated areas. Even under conditions where the tanks cannot be jettisoned, all is not lost. A re
Interim Safety Supplement to
F-4 Dash One directs that the
refueling switch be placed to
tend, thereby depressurizing the
ternal centerline fuel tank and
ting off the fuel source and te
nating the fire. It should be poi
out, however, that no Air F
crew has, as yet, used this pr
dure to combat a centerline
fire. In fact, there is evidence t
dicate that once a leaking tank
comes pressurized and the fu
ignited, a blowtorch effect o
which produces intense heat
will burn through the tank i
Once tank burn-through occurs
the burn out area enlarges, pre
ization is no longer a concern.
fire can continue to burn withi
tank, and the fuel may contin
be sucked into the engine bay
by negative pressures at ce
throttle settings. It is obvious
once the fire has reached this p
depressurizing the centerline
will do little good.

The importance of F-4 air
recognizing and correctly ide
ing the emergency early cann
over-emphasized. The intense
generated by the pressurized

F-4 CENTERLINE TANK FIRES CAUSES AND CURES



LT COL TOM PHILPOTT
Twelfth Air Force, Bergstrom AFB TX

ing from a centerline tank is concentrated in the Aero 27 area. Photo 1 shows an Aero ck that was exposed to a cen- tank fire for less than 20 ds. The outer covering of the cable has been burnt off, viring leading to the cartridge ors has started to melt.

xperience is an indicator, one things will happen: the jetti- artridge will fire, jettisoning nterline tank due to the burn- itiator wiring shorting out, or xcessive heat build-up, or the to the initiator cartridges urn through and prevent the line tank from jettisoning even jettisoning button is subse- ly depressed by the aircrew. e first case, where the tank ns due to the fire, all may vell. With the centerline tank ned and the fire source re- l, the fire will be terminated. as occurred in previous cen- tank fires. In the second all may not turn out quite as In fact, in the cases where the ws either did not or could not n the centerline tanks, the F-4 st. In some cases the Aero 27 jection cartridges were found fused but not fired even though the F-4 crashed and had burned for several hours. Again, it becomes obvious that the aircrew needs to be alert, recognize and identify the problem, and make a timely decision to jettison the external centerline tank. Unfortunately, the bold face for fire on takeoff, "External Load-Jettison," is qualified with the words (if necessary).

Several aircraft commanders have commented on the fire on takeoff emergency: "As long as I have control and power, I intend to fly the aircraft and get some altitude and worry about jettisoning the tanks later." While no one can argue with the wisdom of flying the aircraft and getting a little altitude, it must be pointed out that jettisoning the tanks later may be too late.

Another area of similarity in the five most recent major centerline tank fire accidents was that maintenance personnel had not completed the external centerline tank installation checklist. Specifically, the tank operational check, including the fuel transfer and pressure check, had not been performed. There is little doubt that, had the centerline pressure check been accomplished, the leaking centerline tanks would have been identified. Again, one might ask, "What's the problem?" Tech orders and checklist clearly outline the proper procedures. Perhaps the statement given by the crew chief of the last F-4 lost due to a centerline tank fire contains the answer. "There's nothing to loading centerline tanks. We've been doing it since year one. It was one of the first jobs I did on the line."

The old adage that familiarity breeds contempt or, in this case, complacency, indeed contains a grain of truth. Unfortunately, in addition to complacency in loading centerline tanks, there also appears to be several widely held misconceptions concerning operational checks of the external centerline tanks. The following comments made by crew chiefs on performing operational checks appear to be typical. "After I hang a tank I just open the centerline tank fuel shutoff valve and let a few gallons run into the centerline tank. I know it checks the tanks because I've found a lot of leaks this way and I don't have to waste time waiting for the fuel truck or doing an engine run for the regular centerline tank oper-

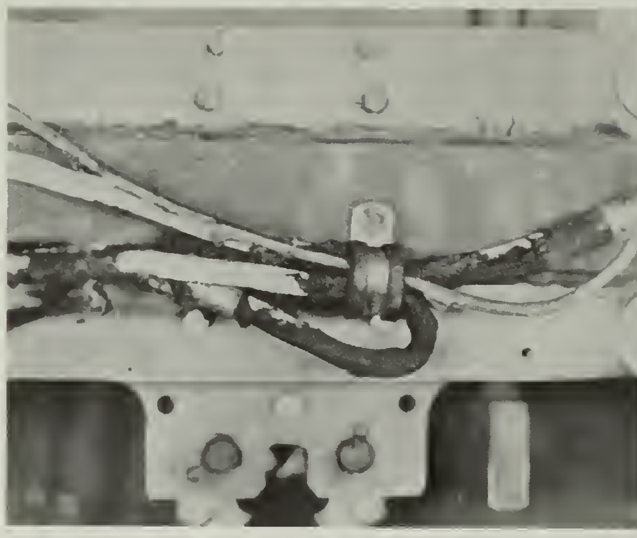


Figure 1
Aero 27 rack exposed to a second centerline tank fire showing charred wiring bundle.

Figure 2
Centerline tank improperly installed with crimped standpipe. ' seal out of place and red band placed too low in aircraft fu disconnect.

ations check. If the tank didn't leak with fuel coming in, it won't leak going out."

Not a bad rationale unless you consider the fact that fuel, gravity feeding from the fuselage tanks into the external centerline tank, will not necessarily identify all leaks. Many leaks will not become apparent until the centerline tank is pressurized to the normal operating pressure of 16 psi.

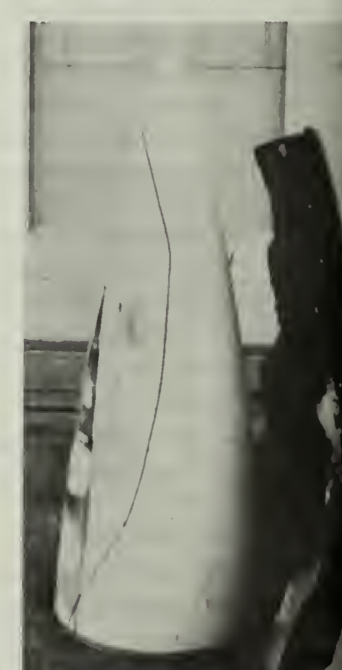
Another comment frequently made by many crew chiefs is: "I don't worry about the centerline tank operations check because we use single point hydrant refueling which pumps fuel under a pressure of 55 psi. If the centerline tank doesn't leak with 55 psi it isn't going to leak. So why should I bother with an operation check which only pressurizes the tank to 16 psi."

Again, the rationale sounds good until all factors are considered. First, while fuel from the single point refueling hydrant enters the aircraft at 55 psi, it branches into several fuel manifolds which substantially reduces the pressure in any one fuel line. Depending upon the particular point in the refueling cycle there may be only 5 to 6 psi in the centerline tank fuel line. Many centerline tank leaks will not become apparent during refueling and can be identified only when the operational fuel transfer and pressure check is performed. Also, while both methods previously mentioned might catch some fuel leaks, they do not check whether fuel can be transferred. Obviously, too important a step to omit.

Is this a widespread problem? Apparently so, as all of the aircraft lost due to centerline tank fires have been from different wings. In a 60-day period one F-4 wing experienced two centerline tank fires, and one transient aircraft landed with the centerline tank improperly installed and not feeding. While maintenance personnel in several wings have implemented training programs with an increased emphasis on proper centerline tank installation, it is a problem area which obviously will require continuing and on-going emphasis if it is to be solved. It goes without saying that a little extra attention to the external tanks during inspections would also be in order.

Of course, a double fire warning light on takeoff does not necessarily have to be a centerline tank fire; but it should be one of the first things that a prudent aircre siders. However, it cannot be emphasized that once the cr termines that the emergenc possible centerline tank fire, ly decision to jettison the e tanks or extend the in-flight ing receptacle is absolutely r tory, if the aircraft is to be ered safely. ★

Normal tail cone section with tail co centerline tank showing effects of ta through from a centerline tank fire. craft subsequently crashed.



OPS TOPICS

IFC APPROACH"

The "IFC Approach," a series of articles on instrument flying featured in *Aerospace Safety*, has ended with the deactivation of the USAF Instrument Flight Center. *But* there's good news with the bad. The series will continue sometime next fall courtesy of Air Force Communications Service. To get a feel for *your* needs, AFCS needs your suggestions and questions. Their address is HQ AFCS/FF, Scott AFB, IL 62225. AUTOVON numbers for specific activities are: TERPs: 638-5431, FLIP: 638-5479, ATC Procedures: 638-5462.

HE EJECTION TORY

During the month of May, there were 4 ejections with 3 survivors and 1 fatality. The fatality apparently was caused by the effects of a high-speed ejection. There was also a midair collision between two ejection-seat-equipped aircraft from which neither pilot tried to eject. Both pilots were killed.

EJECTION MISHAPS

	Ejections	*Fatalities*	*% Survived*
Jan-Apr 1978	26	7	73
May 1978	4	1	75
TOTAL	30	8	73

NON-EJECTION MISHAPS

	No. Crewmen	*Fatalities*	*% Survived*
Jan-Apr 1978	11	6	45
May 1978	2	2	0
TOTAL	13	8	38

Four of the non-ejection survivors, through April, were from two landing mishaps which resulted in destroyed aircraft. The other was a lucky pilot whose aircraft struck the ground and the impact threw the seat high enough for it to act like it had ejected. He got a good chute and survived. The aircraft did not.

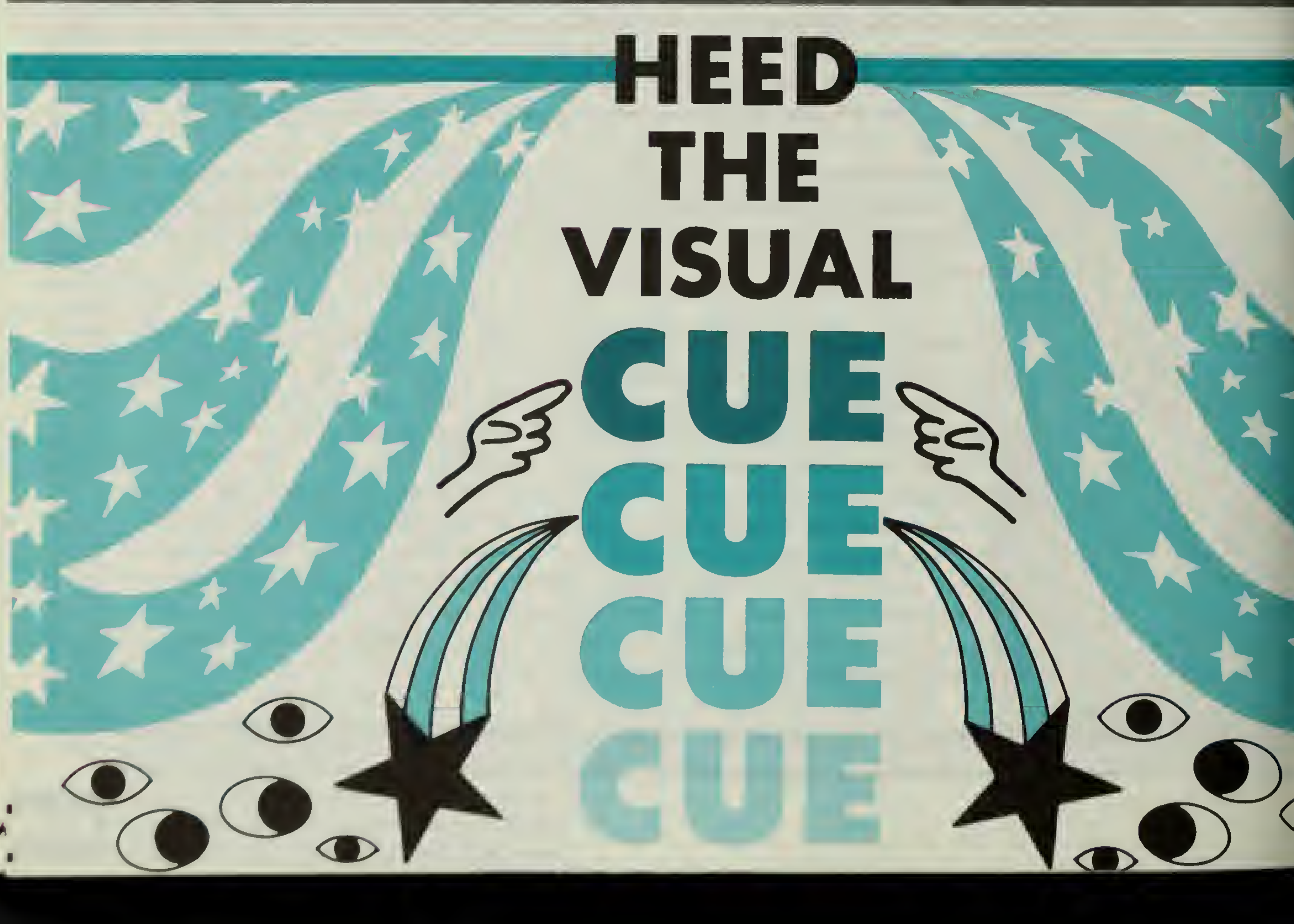
Overall, the message that is evident from these figures is that the chances of surviving a destroyed aircraft mishap are a lot better if you use the ejection seat in time for it to save you!—Mr. Rudolph C. Delgado, Directorate of Aerospace Safety.

EAK ROCEDURES= EAR MIDAIR

A B-52 was following prescribed strategic training route (STR) procedures. A fighter crew, however, failed to maintain route timing and arrived at their I.P. well in advance of the scheduled time. They also failed to abort the route as required when the timing error became apparent. This error was compounded when the crew misinterpreted the STR radio call "cleared on range and frequency." This call merely constitutes acknowledgement of the initial call-in. However, on tactical ranges, similar phraseology is used to clear aircraft into the target area; and it was interpreted in that manner by the fighter crew. A lack of knowledge of STR procedures on the part of the crew is apparent. Confusing radio phraseology also existed. Have it together before you enter a route, range or area. Procedures and timing are established to provide separation and prevent mishaps. ★

Sometimes a potential cause of an accident looks us in the eye and we don't see it. Hence, we must be alert to visual cues, as this article reveals so vividly.

HEED THE VISUAL CUE



hank heaven it was a taxi accident! It was an overcast morning when the crew completed ight of their EC-121, airborne ing and control aircraft. Every- checked out okay, and the 17 members piled into their air- for what was to be a routine ing mission. The engines were ed, and the copilot called the r for taxi clearance. Tower ed the aircraft to taxi and the ks were pulled. Things were exceptionally smooth this ing, with plenty of time to for it was 20 minutes before scheduled 0900 takeoff time. her full fuel load, the aircraft ered down the long parallel ay as the crew prepared for ff.

ddenly and, almost instanta- ly, the aircraft fell off toward t side as though the left main ng gear had disappeared. The er two and then number one began to whack at the taxi- The left tip tank dug into the ay apron and the aircraft start- rotate rapidly to the left. The quickly reversed number three our throttles and applied right in an effort to stop the air- and prevent further rotation. taneously, the copilot joined ilot on the right brake and ried the emergency brake sys- s the aircraft continued rotat- 20 degrees while sliding to a When the left wing fell to the d, the right wing and wingtip ank (with its 2 tons of fuel) ed upward in a violent mo- As the aircraft rotated left, the ip tank snapped off, ruptured, as caught under the rear fu- spreading a bed of fuel for craft when it stopped. Fed by ed fuel lines, fire in the left well was already out-of-con- hen the aircraft came to rest.

A 23-knot wind fanned the fire from the left back toward the fuselage and the 17 souls inside. When the aircraft stopped, a total of about 8 seconds had elapsed from the initial drop.

Seeing reflection of flames off the number two engine shroud, the pilot ordered the flight engineer to cut all mixtures and rang the emergency alarm bell. The crewmembers in the aft cabin were already keyed for action. The rear crew door was opened, the egress rope thrown out, and they began scurrying out the door. Some used the rope and some, the more impetuous ones, elected to jump to the ground. One individual opened the left overwing hatch but was greeted with flames blocking the exit. He then opened the right overwing hatch and saw flames already coming up over the wing's leading edge. He and a close friend dashed through this exit and departed off the right wing's trailing edge.

After cutting the mixtures, the flight engineer opened the forward crew exit door only to see a cloud of black smoke billowing from directly below. The pilot, copilot, and engineer noted the path to the rear exit was still clear. The pilot ordered them out via that exit. They assembled upwind and took a head count which confirmed everyone clear of the burning craft. The entire evacuation took less than 30 seconds with only two minimal injuries. One individual had his gloves off to adjust his camera when the mishap occurred and obtained rope burns on his hands when he slid down the egress rope. Another slipped while going off the right wing and bruised his leg.

The fire trucks were on the scene immediately but were unable to suppress the massive fire. The crew were examined at the hospital and released. They spent the next few hours rehashing the events during the evacuation and giving thanks and praise for the egress training they received prior to the accident. Their professional, systematic actions, and their knowledge of what to do and how to do it before the need presented itself were instrumental in their escape from an aircraft being engulfed in flames. Their

Just a taxi accident? Fortunately all aboard escaped, but aircraft was destroyed by fire when left main gear failed.

HEED THE VISUAL CUE continued

training and "heads-up" thinking resulted in avoiding a near catastrophe.

Avoiding a near catastrophe? Catastrophe is similar to beauty—it's in the eye of the beholder. And if you're the commander of a unit beholding one of your $2,500,000 aircraft burning to the ground, things aren't exactly beautiful! In fact, until you find out what happened, the catastrophe may be just beginning.

But there is still "no excuse"—so how about a reason? The gear failure was caused by a single, small nick in the surface of the landing gear's upper cylinder. The nick was only 0.6 inches long and 0.015 inches deep but the corrosion in the base metal grew until the cylinder could no longer take the stress from normal operations. The corrosive process was like a hidden time-bomb, slowly growing, slowly ticking off time, until it exploded causing catastrophic failure of the complete gear assembly.

During the accident investigation, it was determined that this nick was on the gear when installed on the aircraft just 1 month prior to the accident. Obviously, no one could have seen the corrosion under the nick, but the nick itself would have been clearly discernible by anyone inspecting the gear during overhaul, packing, uncrating, installation, and routine walk-around inspections. Yet, of all the people having "intimate relations" with this gear, no one noticed the nick until it was pointed out by a depot representative during the investigation. It then stood out like a cherry on a Las Vegas slot machine. Why?

Fractured cylinder that finally failed from corrosion under small nick shown in lower right photo. Tiny nick, just .6" long and .015" deep, escaped observation.

Eyesight wasn't the pro
Everyone involved had ade
vision to read the print in th
data and make sure there we
requirements for checking fo
chanical defects on the non-ch
surfaces of the strut. The la
tech data was part of the pro
but vision was obviously not
tor. So why wasn't the nic
tected?

The answer is in the under
ing of the phenomenon calle
ception. Perception involve
only focusing one's attention
cue, the nick in this case, bu
attaching a degree of value
cue to make it significant. Th
dition of a specific check
tech data should solve the pr
of directing attention to suc
fects. But how do you get so
to attach the appropriate, s
cant value? Perhaps the qu
can be partially answered by
forcing one's value system th
education.

The photograph left show
nick on the gear strut. If yo
imagine the cylinder all in
piece, the nick might not
much to you—not significant.
ever, associate the nick wit
fractured cylinder shown i
photo left. Does the nick
any significance now?

If your work involves insp
of aircraft components—it s
have significance! Whether y
the birds, maintain them, or su
them in any way, YOUR JO
VITALLY IMPORTANT.
attention to the condition of a
components from landing ge
the smallest electrical diode
portant. Your identification
seemingly most insignificant
could mean the saving of inva
life.

That 5¢ nick could have m
of dollars worth of corrosion
it and many souls riding on i

ragic Six Days • Part I

ntain Flying continued

vever, because they normally k closer to the terrain and ower airspeeds, the effects urbulence, downdrafts and d direction can be even more ardous. As with fixed wing raft, determining the effects ltitude and temperature on copter performance should part of your preflight plan-. But remembering that ificant variations can exist ween forecast and actual re- e area weather, performance computations must be verified. For instance, an actual aircraft performance check could be accomplished well clear of terrain but at the intended working altitude. Wind velocity and direction are also factors affecting helicopter lifting performance. When a helicopter is operated at or near its service ceiling, a downdraft of 100 feet per minute or more may establish a descent of such magnitude that it cannot be arrested even after the helicopter has cleared the downdrafts.

Turbulence, gusts, and high altitude increase the potential for blade stall and can drastically decrease stall onset speed. An increase in rotor rpm will improve gust response, provide a smoother ride, and decrease susceptibility to blade stall. In addition to severely restricting hover capability, high altitude and/or high temperature operations greatly enhance the chances for power settling, and main and tailrotor droop.

Fixed and rotary wing aircraft can be safely flown at high altitudes, but pilots must anticipate problems and be prepared to cope with them.

A rule for mountain pilots to **live** by: "Always remain in a position that will allow you to **turn** and **fly** downhill." ★

agic Six Days • Part II

Search For Spar 14 continued

experienced in both air and nd searches.

cal Media It pays to adver- Request that citizens report unusual sightings, noise, etc.

her Military Units Nearby s will stand ready to assist usually will not formally offer aircraft or people since don't wish to bother the chers. They believe that if are needed, they will be d on. It's up to the base onsible for the search to call em. Aircraft belonging to services should not be ooked, particularly the Army their numerous helicopters.

MAND AND CONTROL
extensive search effort be too much for the base mand post personnel to han- After the initial, routine steps are taken and prior to the arrival of outside assistance, a SAR staff should be formed, headed by a SAR Mission Coordinator (SMC). This staff assigns search areas, briefs and debriefs search crews, handles message traffic, flight follows the search aircraft and serves as the focal point for te entire SAR effort. Continuity of personnel is important; a search is not a routine operation for most USAF bases; many procedures have to be improvised to fit the situation and a search strategy has to be formulated and pursued. A staff that stays with the effort is in a better position to do this.

Search Area One method of dividing the search area is the national grid system developed for use by the CAP. Under this system, each sectional aeronautical chart is broken up into grids of 15 minutes of latitude by 15 minutes of longitude. The grids are numbered, and each search crew can be assigned one

continued on page 28

Snowmobiles facilitated search in snow-covered mountains.

DISTRACTIO
FATAL,
INSIDIOUS,
HUMAN

gs which need our attention usually do not arrive at convenient intervals, rather, at irregular and ill-chosen times. So, when two items of information arrive at the at the same time, one of these items must wait until the other is processed.

OR THOMAS R. ALLOCCA • Directorate of Aerospace Safety

. . A breakdown in crew coordination and disci- (and safety) was induced by al distracting events such as equirement to make numerous transmissions during the de- and approach phase of flight ne necessity to complete a number of checklist items dur- critical phase of flight . . . ." passage has been extracted a cargo aircraft mishap report ich 15 people perished and rcraft was destroyed.

s is not an isolated incident. ction has also been identified ng a significant contributor to er, trainer, and fighter mis- In one of these accidents, the decided to contact the com- post during a night instru- approach in deteriorating er. The "distracting" effect of ll was judged to be instru- l in the sequence of events g to the accident. The argu- here is not with command transmissions—which provide reased level of management l and safety by keeping su- ors aware of mission progress with the oft-times fatal of distraction.

eviewing the reports which be such mishaps, this finding "intuitively" clear: That the was unaware of the tragic of distraction. Unaware e distraction has a decidedly insidious, human quality. Central to any discussion of this very human problem are the psychological concepts of a single decision channel, short term memory store and stress.

Air Force crew members are neat guys. But, regardless of how neat you are, you can't do two things at one time. I know you think you can—so do I—but studies prove you (or anyone else) can't. Why? Because of man's single-decision channel.

The concept of a human single-decision channel is well-established. Laboratory results show that when two items of information arrive at the brain at the same time, one of these items must wait until the other is processed. The brain is not the only sensory organ so affected; when different messages arrive at the ears at the same time, we act on one and do virtually nothing with the other. It really doesn't matter how the message is received, we can, in fact, attend to only one thing at a time, and it is this central channel which limits our ability to process information.

Now when we combine this single-decision business with another "sad" fact of life, problems can result.

Things which need our attention usually do not arrive at convenient intervals, but rather at irregular and ill-chosen times. So, when two items of information arrive at the brain at the same time, one of these items must wait until the other is processed. Sure, you say, I know all this, that's why I can rank-order those things which should be done first; then I get to the other "less-important" problems. Maybe you can, maybe you can't. But, I think that, given the right set of circumstances, we can all fall victim to distraction's fatal claws. To wit: The first-ever fatal accident of one of the wide-bodied jets—a Lockheed 1011 of Eastern Airlines—occurred near Miami, Florida, in 1972. It's an often-told story, one in which the crew became so preoccupied (distracted) with a potential emergency that they completely neglected what should have been their primary task—to safely fly an airworthy aircraft.

Akin to man's limited capacity for processing and acting upon information is the concept of a short-term memory store.

When two items of information arrive at the same time, we put one in a short-term "memory store" while we process the other. It has been shown, however, that items awaiting action in such a store are quite likely to be forgotten. This is particularly true for the "older" pilot: studies indicate that if he is given simultaneously, say, both a new clearance and a relatively more important piece of information—perhaps the proximity of another aircraft—he may have forgotten

DISTRACTION continued

The pace and stress of modern living has made us all too familiar with situations in which we are required to attend to too many inputs.

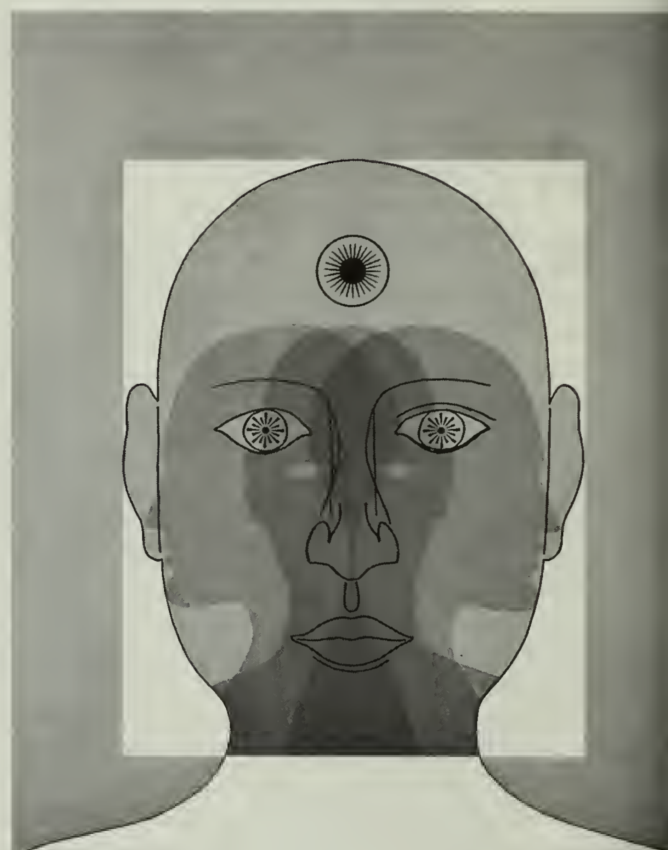
the first piece of data by the time he has processed the "priority" message.

Another item worthy of mention is the concept of psychological or "life" stresses.

A crew member may say that he never allows his work and his "outside" life to mix; such a statement, however, is only partly true. We're 24-hour-a-day people, and things that happen throughout the day—or on preceding days—will continue to occupy places in our mind, albeit not necessarily at the conscious level. Events which happen in one segment of life can influence, in a negative way, what happens in other segments.

Say you've just had a disagreement with the squadron operations officer and it's been bugging you. You're going to take the effects of that quarrel into the next day's flight. And worse—far worse—that crushing comeback you were trying to think of at the time of the disagreement may stay with you and crowd your mental processes to the exclusion of other, more important tasks.

These situational factors, or life events, tax a person's capacity to cope. The pace and stress of modern living has made us all too familiar with situations in which we are required to attend to too many inputs. Among a number of such events, researchers include things like "changes in family member's health," "mortgage over $10,000," and "wife stops work." An accumulation of events, often quite ordinary in today's society, can occur



in the most "normal" of individuals. At such times, we may well be in danger of forgetting or omitting pieces of information at critical times, or at any time, for that matter, in flight.

Single decision channels, short term memory stores, psychological stresses . . . why am I laying this "shrink" talk on you, the Air Force flying public? Because these "shrink" talk items are the principal ingredients of distraction—and distraction, as we have demonstrated, can have a fatal effect on flight operations. Okay, you say, you're

sold on the argument that distra tion is a contributor to flight m haps. Now, you ask, what can about it? Plenty. A complete lis would require a textbook, so le *briefly* discuss administrative r transmissions, ATC problems a the psychological stresses.

Administrative radio calls ar integral part of modern flight o ations. These calls perform a variety of essential managemen functions and have been a majo contributor to the efficiency wit which we operate today. But, th example mentioned earlier indi

ıch times, we may well be in danger of forgetting or omitting pieces of information itical times, or at any time, for that matter, in flight.

in some cases, programs con-d with the best of intentions e counter-productive. What ou and your supervisors do?

Evaluate the necessity to make nistrative calls during critical periods.

Have a crew member, other the pilot team, make adminis-e calls.

If you think you're required ıke too many nonessential inistrative) calls, mention it to supervisor.

oint is this: It bodes ill to lling the command post or tenance control during a night ıment approach, when flying ircraft must be granted first ity.

r Traffic Control instructions nother area of vital impor- to a distraction discussion.

e have a number of examples r mishap files of accidents ı occurred because of confu-on the part of the Air Traffic roller or aircrew. And, given 's busy air environment, it is able that sometime during flying days, you will be issued guous ATC instructions during ical flight period. What can lo to minimize the distracting of such transmissions?

mprehensive and exacting on planning will work won- The entire crew should know pproach to be flown: Such as the initial approach fix, ınd course and decision height d all be thoroughly reviewed. dition to thorough mission ing, strict adherence to radio discipline will help to ease the ATC "problem."

When we make nonessential, ambiguous, or non-standard radio calls we introduce an element of complexity into the ATC system—a system which has as its cornerstone the themes of simplicity and standardization. Review your radio procedures, evaluate your radio discipline . . . if your call sign is "FOX 61" do you occasionally drop the "FOX" and trasmit "61" in acknowledging ATC messages? Think of the potential problem which can be created if there's a . "DUCK 61" in the same area and he does the same thing. Such practices introduce a hazard which may disrupt a routine flight—not necessarily our own.

The potentially disruptive effect of psychological stresses should also be evaluated for their potential effects on flight operations.

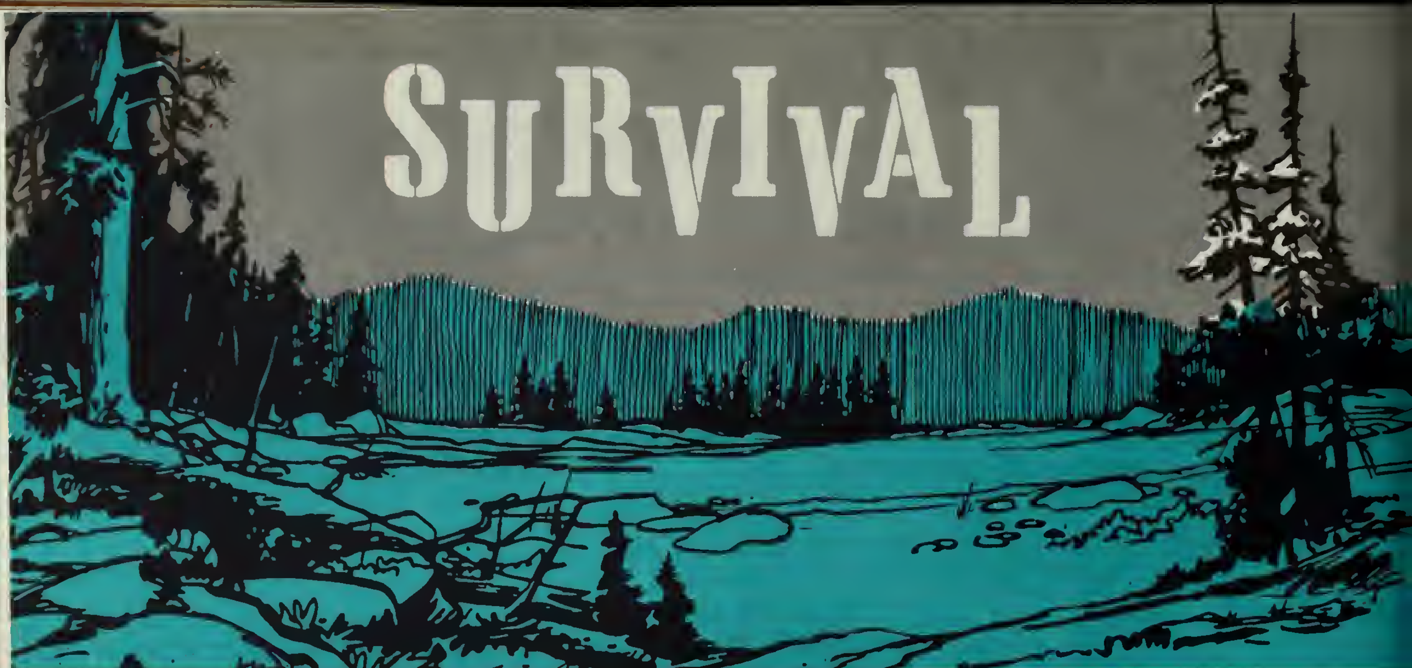
I'll not provide a "short course" on Freudian Psychoanalysis, but you—and your supervisors—should be aware of the problems which psychological stresses can create. Be aware of them and your ability to handle the "problems" which life throws at all of us. I'm not suggesting that each squadron run a "Gestapo-type" network to pry into the lives of its crew members. I am suggesting that we owe it to ourselves—and the Air Force—to know when our ability to perform effectively is lessened. When we become aware of a "reduced" ability, I think you'll agree that it's best to take steps to ensure that it doesn't affect our flight duties. The goal is to not take personal problems into the cockpit. Sometimes a discussion with a friend can alleviate tensions. In extreme cases, request for excusal from the flight may be warranted. But, no matter how you handle it—don't ignore it.

I'll conclude this discussion with the reminder that aviation is a human activity and that mistakes are a normal feature of human activity. This article has discussed one "uniquely-human" kind of mistake—the one which arises from distraction.

The list of distraction "fixes" outlined in this discussion has obviously been brief; suffice it to say that humans can be easily distracted. And whether it's a single-decision channel problem, short-term memory store limitation or psychological hang-up, if distraction occurs during a night instrument approach in weather . . . well, trouble may result.

"Preoccupied with a malfunction of the aircraft's electrical system . . . the crew ignored their primary task of ensuring adequate terrain clearance . . . 12 people received fatal injuries. . . ." Will we ever eliminate this kind of finding from our mishap reports? Perhaps. Perhaps not.

But I believe that by being alert to distraction's potential consequences, the chances are minimized that it will affect flight operations. And if we do that—minimize its effect—we more effectively accomplish the flying task . . . and, when we effectively accomplish the flying task, the odds are better that we will safely accomplish it. ★



The Five P's

CAPTAIN HOWARD R. ALLAN
Training Development Branch, 3636th Combat Crew Training Wing (ATC), Fairchild AFB WA

Do you remember when Milo Minderbinder of "Catch 22" fame replaced all the bandages in the first aid kits with I.O.U.'s? Yosarian was quite upset when he discovered the switch at a critical moment.

A similar incident happened to us some years ago while flying the now-retired C-123 "Queen of the Fleet." If you will permit a war story—the tale has a valuable lesson.

We were flying from a small field on the eastern border of Zaire across the vast African jungle into Kisangani (formerly Stanleyvillė), a city on the Congo River. To make a long story longer, our 2-hour flight was now 2 and one-half hours long and still no Kisangani. We were lost! Navaids in Zaire are few and far between, and our own instruments were suspect. As we cruised over the foreboding jungle the thought of running out of gas and going down in that inhospitable rain forest became closer to reality.

Trying to think ahead, we had the flight engineer open the survival sled. I won't say that sled was old, but I think it was original equipment on our 20-year-old bird. For an airplane flying exclusively over jungle, we found in the kit such things as a 20-man raft, sea marker


Take care of injuries; take inventory of your gear and then make a plan.

dye, and a solar still. But the r
tear-jerker was the UHF survi
radio. Oh, it worked all right,
the only *other* UHF in all of Z
was installed in the *front* of ou
plane. I immediately volunteer
be the unit life support officer.

At last we come to the mora
the story: *Know your equipm*
As soon as you finish this arti
RUN—DO NOT WALK—to
life support shop. Have them s
you what's in your kit. Surviva
aren't all the same, you know.
last count there were more tha
100 different ones in our Air F
If you have changed aircraft
recently, better have a look at
new life-saving equipment. It c
be your margin of safety. Can
work your particular radio? I
dark? Do you still know how t
the night end of the MK 13 fla
A few years ago a downed airm
sat on his vacuum packed sleep
bag ignorant of its real use—he
down in Greenland, at night.

Can you operate the solar st
Do you intend to rely 100 per
on it for your water? Better ch

t first. You might not have he stills are being removed he kits as their shelf life .

k at *all* the equipment. Are nning to read the directions he time comes to use it? o use it *now* in the warm t of your life support shop. have ever tried to assemble 's "Zoom machine" on nas Eve, you know how ating directions can be. ss, cold, or eye injury can rior preparation worth a d words (to adapt an old Proverb).

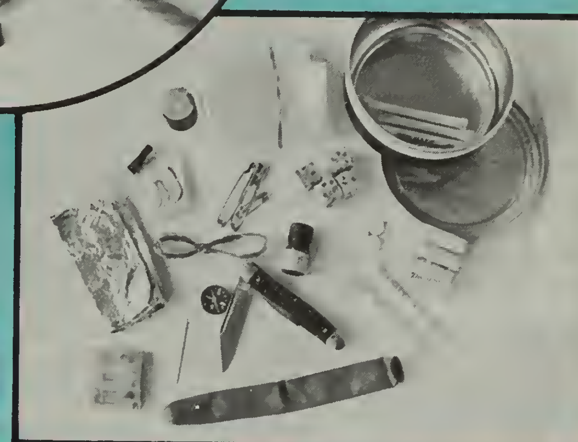
study the contents. Has ncle Sugar thought of all eeds? Instructors at the Survival School recommend nal survival kit to be carried person. Not only does it our equipment to your equirements, but it adds a in case you lose your gov- issue kit. It has happened.

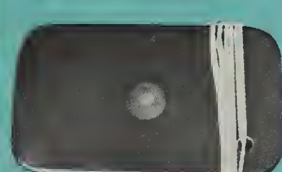
very minimum, you should fire starter (flint, matches), device (whistle, mirror), f procuring food (snare- ning equipment), and first pment (don't forget your medicines such as allergy pirin, or insect repellent).

optional items may come depending on your cir- ces. Consider a sharpening ire saw, chapstick, alumi- , extra compass, food items personal taste (candy, soup, tea, coffee, dehy- eat). Another good idea is ks, gloves, and a scarf.

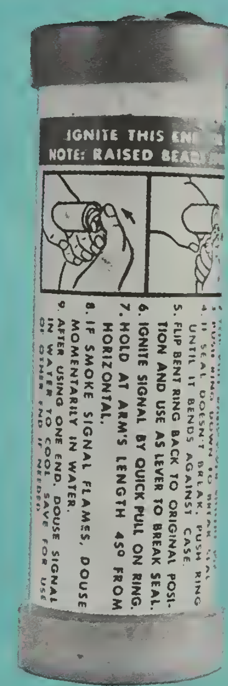
hat leads me to your 922, Life Support Tech- Here is a man with valuable ge. Make him share it with ll be glad to show you all nd outs of your equipment. lly, remember the five P's: *anning Prevents Poor Per- e.* ★

Your personal survival items may be all you end up with depending on your ejection, bail-out, or crash landing situation. Spend some time thinking ahead. When you get there, it's too late to stock up.





An ordinary signal mirror could be your best ticket out of a survival situation.



The URT-33 personnel locator beacon (above left) should be broadcasting your position as you float down. The RT-10 (above right) is currently being replaced by either the PRC-90 (dual channel) or the URC-64 (multi-channel).

The "gyrojet" flares (right) and MK-13 day/night flare (above right). Care needs to be exercised during use to ensure your situation doesn't worsen (fire or injury).

A Tragic Six Days • Part II

The Search For Spar 14

continued from page 21

or more grids, or a portion of a grid.

Flying Safety One important point concerning the search effort is the relationship that exists between the SMC and the search aircraft. It should be fully understood that the aircrews are not relieved of flight restrictions imposed by their parent unit while participating in the search. (The SMC requests the support of these aircraft, but in no sense "directs" them.) Also, it is up to the crew of the search aircraft to determine if the search requirements are within the capability of their aircrew and aircraft considering terrain, weather, etc.

SAR command post was busy during intense search for missing aircraft.

Airborne Command and Control An on-scene command and control aircraft can be invaluable to the SMC both as a radio relay and to log search aircraft in and out of the areas. The HC-130s are, of course, ideal for this role. The crews are trained to serve as on-scene commander during the rescue phase, they have a flare capability that can be used to aid ground search parties at night, and their pararescuemen can come in handy. Another aircraft that can greatly assist the SMC when a large number of search aircraft is involved is the E-3A AWACS. When the search for Spar 14 entered its fifth day, and 50 aircraft were involved, an AWACS was requested to monitor the search patterns by tracking the search aircraft to determine if there were any holes in their search patterns. Coincident with its arrival on station, the searchers began finding the downed aircraft, so an evaluation of its search monitoring could r made. However, the AWA crew was able to provide to rescue aircraft, and ge assist the HC-130 that wa ing as on-scene commande

Wreckage is extremely hard to see on brush-covered slope. In many searches several aircraft have flown directly over wreckage without spotting it.

There is no "best" wa a base to conduct a search The terrain, climate, type search vehicles available even the season of the ye determine the optimum s strategy. It is usually adv to completely cover the s area at different times of t day, to take advantage of v sun angles. At any rate, an ganized, methodical repet and redundant search eff stands the greatest chance success.

But the most importan acteristic of any search e is perseverance. When Sp was finally found, it was o miles from its last know position. The badly twiste burnt wreckage was in a on the side of a mountain t had been "thoroughly" s for 5 days. Perseverance p

ABOUT THE AUTHOR

Colonel Jenkins is the A Deputy Commander for O tions, 474th Tactical Fight Nellis AFB, Nevada. He wa missioned through the AFR program in 1957. Followi completion of UPT and F- gunnery school, he served as an Instructor Pilot at L AFB, Texas. He flew a com in the B-26 at Bien Hoa, R and then was assigned to burt Field, Florida, as an A- pilot. Another combat tour (F-105D, Takhli) was follo staff duty at HQ PACAF a Air Staff. He is a distingu graduate of the Air War C class of 1977. ★

TES AIR FORCE

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contribution
the
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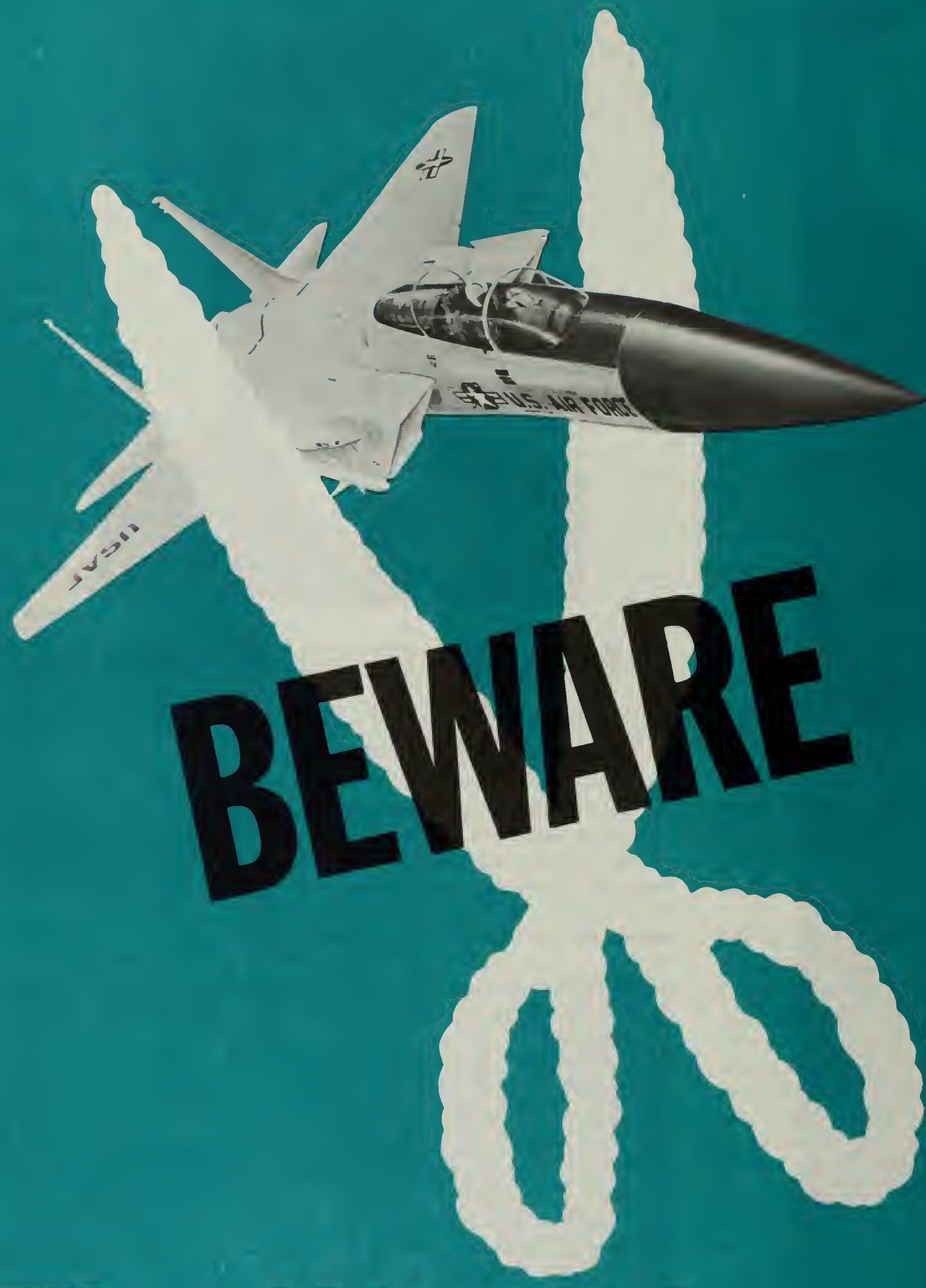
Prevention
gram.

MAJOR JOHN M. EGAN

181st Tactical Fighter Group (ANG)
Hulman Field, Terre Haute, Indiana

On 1 November 1977, Major Egan was flying as an F-100 instructor pilot on an instrument training flight with an upgrading pilot in the rear cockpit. After an uneventful takeoff, Major Egan was ready to raise the flaps when he heard and felt a loud explosion accompanied by a sudden loss of thrust. He disengaged the afterburner and surveyed the engine instruments. No abnormal readings were noted, but the decay in thrust continued. Major Egan turned back toward the departure runway for an immediate landing; however, the close proximity of the aircraft from the end of departure runway precluded a safe landing in the reverse direction. He recognized this and planned to land in the same direction as that of the departure. As Major Egan flew the aircraft to a downwind position, thrust continued to decay and altitude was sacrificed to maintain a minimum airspeed of 190 knots at military power. A staccato engine vibration continued throughout this time. He briefed the rear cockpit pilot on ejection procedures and fuel tank jettison options because the option for an immediate ejection was still available should further thrust decay occur. The aircraft continued to descend on downwind and throughout the final turn. Major Egan selected one-half or intermediate flap position in an effort to hold his altitude. This action drastically reduced the descent rate, the final turn was made, and a safe landing completed. Initial engine analysis revealed severe damage to the engine turbine area. Approximately one-half of the last stage turbine wheel had disintegrated, the second stage turbine wheel was partially damaged, and the first stage turbine wheel was the only normally functioning portion of the turbine. Major Egan's good judgment and superior planning during this extremely hazardous situation possibly saved a valuable United States Air Force aircraft. WELL DONE! ★

BEWARE



The Windshears

aerospace

SAFETY AUGUST 1978

AUGUST 1978

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AUGUST 1978   AFRP 127-2   VOLUME ~~35~~ 34   NUMBER

WIND SHEAR

T DAN WHITE, USAFIFC
COL WARREN R. HORNEY and
T TED THOMPSON
torate of Aerospace Safety

ne purpose of this article is to provide some suggested techniques for detecting and coping vith certain wind shear situations. We will ex- upon methods that will allow the pilot to pre- vind shear, including its magnitude. Knowing is present is an important step toward being to handle a dangerous situation. We want to it clear that the following techniques work n precision approaches and only for wind shear ions caused by fronts or the low level jet. This ound like a very limited application to a lot of e, but we feel that something is better than ng.

first objective in dealing with wind shear is ility to detect it. If the runway surface wind is ed as calm but your indications at the outer r (via INS, Doppler or VVI) tell you that a 20- eadwind exists at your altitude you will expect e 20 knots of Indicated Airspeed somewhere al. If the wind shears out gradually, no prob- you will gradually decrease power and blame bump in the glide path. But if the shear zone narrow the aircraft will abruptly lose indicat- speed equal to the shear differential. Of course, ver you encounter this shear the more critical esponse becomes. The first two steps in our ted technique will enable you to detect a pos- vind shear situation.

ON APPROACH Using groundspeed during the approach is important because it ensures flying airspeed at all times, even in abrupt wind shear situations. During a recent NTSB accident investigation, a highly experienced airline captain stated that using the groundspeed method was the only thing that allowed him to avoid disaster when his DC-8 encountered a wind shear while on final approach. FAA tests have shown that groundspeed is just as important as indicated airspeed when flying through a wind shear.

That is a radical departure from the school of thought that says a stabilized and constant indicated airspeed with very small power changes will result in the best precision approach. Under wind shear conditions the latter technique can result in a severe energy deficiency with catastrophic results. The groundspeed technique is a new concept in airmanship. It may require abrupt power changes, and accepts relatively radical indicated airspeed changes, and accompanying aircraft attitude changes (without trim) to maintain a minimum groundspeed; hence the kinetic energy to allow the aircraft to experience a sudden loss of indicated airspeed (LIFT) but still have sufficient airspeed (LIFT) to maintain safe flight.

The technique is to compute an "over the fence" groundspeed using the reported surface winds and

WIND SHEAR

continued

Knowledge of surface wind and wind at your altitude will alert crew to possible shear condition.

then fly the approach at that groundspeed, or faster if required, but never slower. This means we now have **two** minimum approach speeds to worry about: a minimum indicated airspeed, a**nd** a minimum groundspeed (the computed "over the fence" groundspeed). Therefore, in order to maintain the minimum approach a**irspeed**, the groundspeed during the approach may be well above the "over the fence" groundspeed we computed. Conversely, in order to maintain minimum approach **groundspeed**, the indicated airspeed may be well above normal. Notice that in no case do we allow either speed to be low! For people who have INS, Doppler, or groundspeed indicators, it is as easily done as said. What about the rest of us? Simple. We will resort to our superior skill and cunning AND our VVI to come up with an "approach groundspeed indicator."

There is a direct correlation between groundspeed and the VVI when the aircraft is stabilized on the glide slope. Let's quickly examine this relationship. A 3° glide slope descends 318 feet per nautical mile. For every nautical mile we track over the ground, we must descend 318 feet in order to stay on the glide slope, i.e., for a groundspeed of ONE NM PER MINUTE, the VVI will be 318 fpm if we stay on the 3° glide slope; for a groundspeed of TWO NM PER MINUTE, the VVI will be 2 × 318 = 636 fpm. Those who are mathematically inclined will readily see that:

$$\frac{\text{VVI Readout When Stabilized on Glide Slope}}{\text{Descent Gradient on Glide Slope}} = \text{Groundspeed in Nautical Miles Per Minute}$$

So we get stabilized on glide slope and then d
our VVI readout by 318 (or 265 for a 2½°
slope) to get our GROUNDSPEED in nautical
per minute and then multiply by 60 to get gr
speed in knots. TIME OUT! Even though all o
above may be accurate, it may also be too cu
some to be useful to the pilot in the cockpit.
we can use is a simple method that will give a
approximation of our groundspeed while we a
the glide slope. The following is such a method

AFM 51-37 requires that we determine an
descent rate. The easiest way to do that is by
the Rate of Descent Table in the front of the H
Low Instrument Approach Procedures book.
that a 3° glide slope and 120 kt groundspeed
descent rate of 635 ft per minute. (So they are
1 ft per min). But looking at the Rate of De
Table we see that we can also enter with de
angle and vertical velocity to get our actual gr
speed. We are now ready to use a 3-step app
to work the wind shear problem:

Step 1. Determine expected VVI (from table).

Step 2. Use actual VVI to get groundspeed
table, after stabilizing on precision final appro

Step 3. Adjust airspeed, if required. Notice
with a headwind the airspeed adjustment will
the VVI to the expected value from Step 1.

Now let's run through a couple of simple exa
to make sure we have it down pat. First, suppo
are going to fly a 3° glide slope at a final app
airspeed of 160 KIAS. From the reported su
winds we "wag" a headwind component of abo
kt, so our "over the fence" groundspeed is

Step 1 we now expect a VVI of 795 fpm (let's 300). However, once stabilized on final approach, ote an actual VVI of about 650 fpm. Step 2 tells hat our groundspeed is really only about 120 or a difference of 30 kts from what we expected. low, since we want to maintain a minimum ndspeed of 150K, Step 3 tells us to add 30 kt to AS, so we would fly 190 KIAS and our VVI would down to 800 fpm. By the way, if our airspeed es some placard speed, we probably should der abandoning the approach at this point.

another example, let's fly a 2½° glide slope 140 KIAS approach speed. With a 10K head- on the surface, we expect a 130K "over the " groundspeed. Step 1 tells us to look for a VVI of 570 fpm. However, on final we see 650 Step 2 tells us our actual GS is about 150K. w see we have a 10K tailwind, and a 20K wind change between where we are and the surface. since we never reduce below approach speed, step 3 tells us to maintain our 140 KIAS on final and accept the higher descent rate. But in this case we are forewarned of the energy excess situation that may be awaiting us if the wind shears out at low altitude.

The above method is far from a complete resolution to the wind shear problem. However, it does tell the pilot that a shear exists and it does give an approximation of the magnitude of the shear. Moreover, use of the method ensures that when we encounter an abrupt shear, we will still have flying airspeed. If the shear occurs gradually, continuous power adjustments (monitoring the VVI) will be necessary. However, most of the excess energy (in the form of extra airspeed) will be dissipated by the time we reach the threshold. The opposite case of excess energy (in the form of extra groundspeed) may not be dissipated by the time we reach the threshold. That means the landing roll will be **increased**. In any case, the pilot should be prepared to execute a timely go-around.

It is a suggested technique. We offer it in the hope that it will help you combat the effects of wind shear. Try it. You'll like it! ★

Figure Number 1

INSTRUMENT APPROACH PROCEDURE CHARTS
RATE OF DESCENT TABLE
(ft. per min.)

descent table is provided for use in planning and executing precision nder known or approximate ground speed conditions. It will be especially approaches when the localizer only is used for course guidance. A d, power, attitude combination can be programmed which will result in glide rate and attitude favorable for executing a landing if minimums r breakout. Care should always be exercised so that the minimum itude and missed approach point are not exceeded.

GROUND SPEED (knots)

5	60	75	90	105	120	135	150	165	180
0	210	265	320	370	425	475	530	585	635
00	265	330	395	465	530	595	665	730	795
0	320	395	480	555	635	715	795	875	955
0	370	465	555	650	740	835	925	1020	1110
5	425	530	635	740	845	955	1060	1165	1270
5	475	595	715	835	955	1075	1190	1310	1430
5	530	660	795	925	1060	1190	1325	1455	1590
5	580	730	875	1020	1165	1310	1455	1600	1745
5	635	795	955	1110	1270	1430	1590	1745	1905
5	690	860	1030	1205	1375	1550	1720	1890	2065
5	740	925	1110	1295	1480	1665	1850	2035	2220
5	795	990	1190	1390	1585	1785	1985	2180	2380
5	845	1055	1270	1480	1690	1905	2115	2325	2540
5	900	1120	1345	1570	1795	2020	2245	2470	2695
5	950	1190	1425	1665	1900	2140	2375	2615	2855
0	1005	1255	1505	1755	2005	2255	2510	2760	3010
0	1055	1320	1585	1845	2110	2375	2640	2900	3165
0	1105	1385	1660	1940	2215	2490	2770	3045	3320
0	1160	1450	1740	2030	2320	2610	2900	3190	3480
0	1210	1515	1820	2120	2425	2725	3030	3335	3635
[illegible]	1260	1575	1890	2205	2520	2835	3150	3465	3780

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THE SMART WAY TO GO AROUND

CAPTAIN BOB ZIENER
Air Force Military
Personnel Center
Randolph AFB TX

WARNING

The Inspector Gener has determined th snap decisions ca be hazardous to you health.

Decisions. *Decisions.* Eve most routine flight re hundreds of timely, p decisions. The USAF expend mendous amounts of time and ey to give its pilots the trainin experience necessary to make intelligent decisions. That's p what flying airplanes is all ab

Among the many decisions must make is one that can be cal to the safety of the flight. decision which, when not co and timely made, has destroy merous aircraft and cost many their lives. That is the decis initiate a go-around after down. An untimely decision insufficient runway remaining safely airborne may be catastr Recent accidents clearly sho even the most seasoned aviat seriously misjudge the capabi his aircraft to successfully go-a during the landing roll.

1977. A commercial airline expectedly "floats" on landin touches down 2,500 feet do 4,658 foot runway. After ini breaking, the pilot decides t

ot stop on the remaining run- After he initiated a go-around, e spool-up time exceeded re- ing runway length. . . .

. After touching down on a runway, a T-38 pilot retracts ing flaps to increase weight on nain gear. He decides that he ot stop in the remaining runway nitiates a go-around. Due to laps being up, the required ff roll exceeds the remaining y length. . . .

A commercial airliner touch- vn extremely long on a snow- d runway. After applying re- thrust, the pilot decides he stop in the remaining run- nd initiates a go-around. Due high speed, the thrust revers- e incapable of being slowed e pilot is unable to apply for- thrust. The aircraft departs nway at high speed. . . .

common denominator in isasters was not that the pilot he decision to go-around, but *when* he made the decision to ınd. During normal flight g, it takes about 15 minutes rectly analyze the situation mpute takeoff data. Pressure , temperature, wind, runway runway surface condition, gradient, and aircraft weight cisely combined to yield sev- act parameters (flap setting, heck speed, rotation speed, speed, takeoff distance, etc.) re used to assure a safe take- , in each of the above situa- e pilot made a snap decision the landing and attempt a akeoff in an extremely dy- ituation with little, if any, l takeoff data.

can you avoid this perilous The key lies in better pre-ap- planning. The first step is o figure your stopping distance and compare it to available runway length. But don't stop there. Using the aerodrome sketch on an approach plate, determine the absolute maximum acceptable touchdown point and then positively fix it, using runway markers or a known geographic point (taxi-way, intersecting runway, etc.). If you are not on the ground, on speed, and ready to start breaking by this "go/no-go" point, a go-around may be in order.

An important point to remember is that a go-around after touchdown is still just that—a go-around. Most complex aircraft have different procedures for executing a go-around vs a touch-and-go. The touch-and-go is a training maneuver specifically designed for certain conditions and pilot proficiency. Since many Air Force pilots are not trained for proficiency in touch-and-go procedures, trying to decide between initiating go-around procedures and touch-and-go procedures can waste valuable distance and speed at an extremely critical time. A well-timed go-around with appropriate steps to eliminate any deployed drag devices (speed brakes, spoilers, drag chute, etc.) is probably the best course of action. Consideration should also be given to lowering the nose while on the runway to put the aircraft in its best acceleration attitude.

Once on the runway and beyond the "go/no-go" point don't be deceived by the slow rate of airspeed decay. Remember, during the landing roll, it's kinetic energy—not indicated airspeed—that decreases at a constant rate. The actual stopping situation for an aircraft touching down at 150 knots ground speed with 8,000 feet of runway remaining and decelerating at a constant rate is depicted in Figure 1.

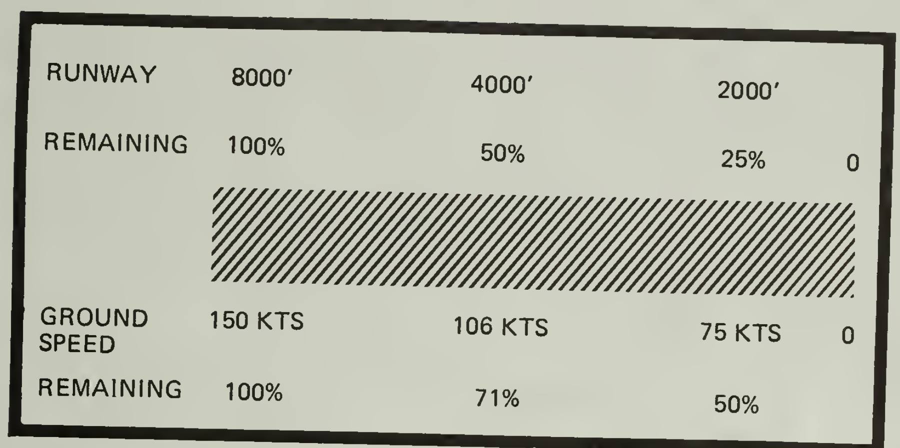


Figure 1

That 75 KTS with 2,000' remaining on a wet runway looks terrible from the cockpit, but a safe stop is still possible. Any situation seriously affecting stopping distance (hydroplaning, excessive reaction time, mechanical malfunction, improper configuration/aerobraking, etc.) could be detected by checking for the 106 KTS GS at 4,000' remaining. It's also during this portion of the landing roll that the aerodynamic stopping devices are becoming progressively less effective and the brakes are becoming more effective. Since most of the variables are behind you, the ability of the aircraft to stop in the remaining runway is largely dependent on your braking proficiency.

Decisions need not be hazardous to your health. The key is preparation. Know the performance limitations of your aircraft, but just as importantly, know how to handle them. ★

DO IT IN OKLAHOMA?

CAPTAIN JAMES J. LAWRENCE
Directorate of
Aerospace Safety

Sounds like a pretty attractive offer, doesn't it? Yet, if I add to the above classified the fact that this excellent opportunity is as an instructor pilot at the 443d Military Airlift Wing (MAW), different visions are conjured up. For the uninitiated, the 443 MAW is the Military Airlift Command's training wing located at Altus AFB in Altus, Oklahoma. Despite the fact that all the information in the above want ad is true, MAC is having a difficult time recruiting instructors to

serve there. I recently had th portunity to spend some time tus. What I found was distinct ferent from my expectations rived from discussions with and C-5 pilots.

Despite the standing jokes l spent a week at Altus one da "Don't breathe when the w blowing from the south," I tho ly enjoyed the visit. What I was a group of people dedica their mission. They are allow think freely and try new id

uct of the training environment h is often lacking in a large ational wing. The community endly, albeit small, and geared rd the sedate life of the many ounding farmers and their fam- Homes are reasonably priced, recreation opportunities are dant.

y purpose here must be rather ous by now. This will be the of the people and mission of AFB. Hopefully, the goal is t some of you career-oriented pilots to think again about ros and cons of a tour of duty at southwest Oklahoma base. If est of the audience can gather e reserve to read on, you, too, enjoy this story of people and efforts to improve themselves, wing, and the United States Force.

's begin with a description of wn and the base. The city of located about 3 miles from eld, is a typical southwest Ok- a farming community. Wheat major produce grown, and the nearly devoid of industry (as s air pollution). Some of the department chains are begin- o set up in Altus, recognizing owing market, but the majori- established businesses are of mily-owned and run variety. r two visits and proprietors nize you as a regular customer eet you by name. A pleasant on, especially for a big city r, like me.

city officials and the inhabi- maintain an excellent rapport ase personnel. Their motiva- as much economical as it is hospitality, for the base is gle, biggest economic stimu- the community. The local rd of living would decline without the support of Al- B.

Altus area offers a great deal way of extracurricular activi-

An aerial view of Altus depicts the small town atmosphere and the surrounding farm land. Agreeable weather and very light air traffic make Altus AFB an excellent site for qualification flight training.

ties for those of the outdoor persuasion. The country is wide open and a heaven for campers, off-roaders, fishermen, hunters, hikers, and bikers. There is a lake for boating and water-skiing and open, uncongested skies for the light aircraft enthusiast. Housing is abundant and equitably priced, but as the town grows, so does the cost of homes. Home ownership appears to be a sound investment in Oklahoma, just as it is elsewhere in the US.

The base is equally alluring. MAC has spent a good deal of money modernizing and beautifying the facilities. Most of the older structures have been or are soon to be replaced; to include a new hospital. The host wing runs a very active recreation program. Activities include many sports, art festivals, classic art films, chess and billiard tournaments, trips to Dallas and Las Vegas, and much more.

Without doubt, Altus AFB has everything to offer the military family that one could find at any Air

OKLAHOMA? continued

Force Base. Reasonably priced homes, good schools, low taxes, and residents receptive to military neighbors make off or on base living a comfortable, pleasant existence.

The 443 MAW conducts 25 different courses of formal training for aircrews and special ground personnel of the Military Airlift Command. The primary mission is to provide transition training for aircrew members on the Lockheed C-141 "Starlifter" and the C-5 "Galaxy."

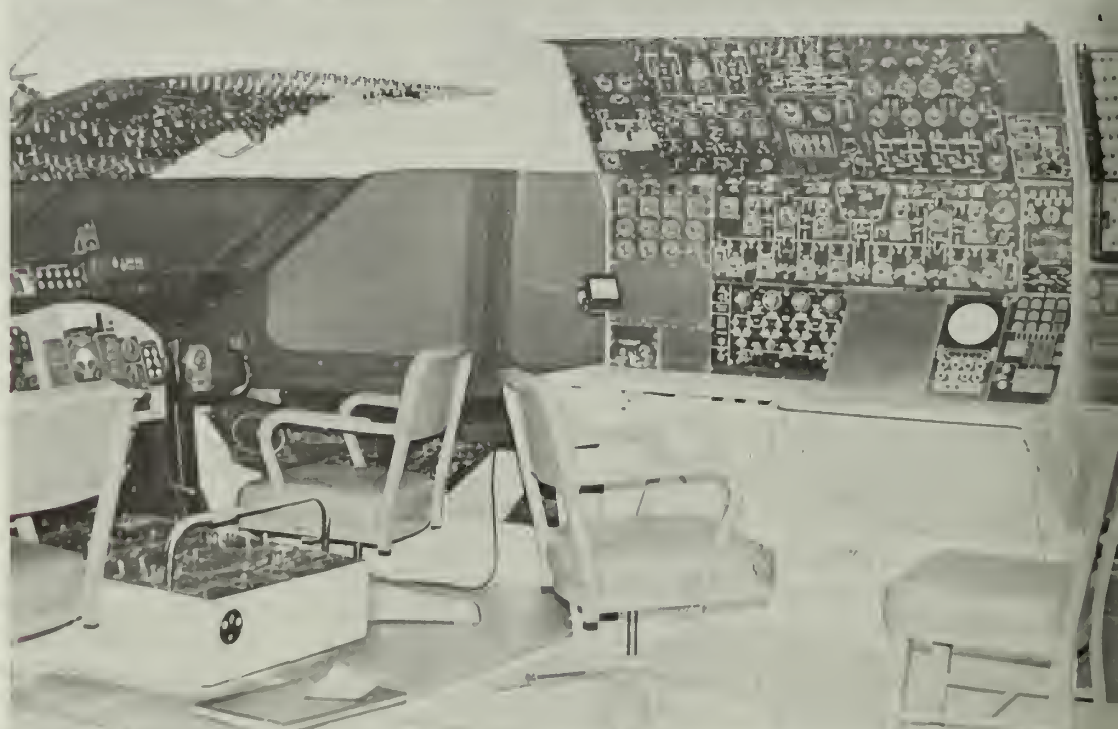
Initial pilot qualification training consists of 4-weeks of intensive academic training followed by 4-weeks of flight simulator and flying training. The ground academics are provided by the 443d Technical Training Squadron, and flight and simulator training are accomplished by the 56th and 57th Military Airlift Squadrons; the 57th for the C-141 "Starlifter," and the 56th for the C-5 "Galaxy."

Training is conducted for C-141/C-5 initial qualification, first pilot/aircraft commander, upgrade, and instructor qualification. Several navigator, loadmaster, and flight engineer qualification programs are also conducted. Air transportation personnel from MAC passenger and cargo terminals are also trained at Altus. C-5 pilots are instructed in an aerial refueling course and C-141 pilots, navigators, and loadmasters are trained in aerial delivery systems for combat, world-wide airlift, and humanitarian mission support.

In addition to this high training commitment, Altus provides operational airlift support for MAC's Twenty-Second Air Force. They also support MAC Headquarters at Scott AFB, only 1 flying hour away, for VIP airlift. The 443d's mission is a large one but the peopl key ingredient for success, a ones that carry the ball. Ne tell you about some of the in tive things these people are do Altus AFB, in the sleepy to Altus, Oklahoma.

The Technical Training Squ (TTS) is responsible for pro the academic training progra 19 of the different courses of In the last calendar year, 3,20 dents received instruction a squadron. The staff consists highest qualified and most e enced people from the opera units. Their extensive expe plus the necessity to possess effective communicative skil sults in a very select staff of u and dedicated people. Many o contributions have greatly enh the quality of the training pr and saved the Air Force a bu

The cockpit procedural trainer allows student pilots and flight engineers to learn their stations and checklists. Here, the stude familiarize themselves with the new environment at their own pace, without wasting valuable simulator or aircraft time.



ırs at the same time. Here are a couple of them.

/e all know flying airplanes costs money. Simulators were devel- l partly to cut down on the t time needed to train an indi- al. But today's highly sophisti- l flight simulators, though per than aircraft, are still ex- ive to operate. The people at TS have gone one step farther. have constructed cockpit pro- ral trainers by scrounging air- equipment from airframes in ents or building their own :-ups. They then developed slide presentations which the nt uses to learn the cockpit, in- ıent panels, normal and emer- procedure checklists, limita- and the like. This system has omized on the needed simu- time and made simulator train- nore effective due to crew fa- rity prior to exposure.

e instructors at the TTS have ogether a library of tape/slide ntations on the operation of any complex aircraft systems e C-5 and C-141. These shows esigned to supplement the nor- nstructional syllabus and they ent many long hours of indi- effort to improve the training am. Presentations are con- l individually, by the student, learning center. All personnel ee to use these facilities when- ney can spare the time. It's not al at all to find a resident examiner sneaking down to up on his systems knowledge o an annual flight evaluation.

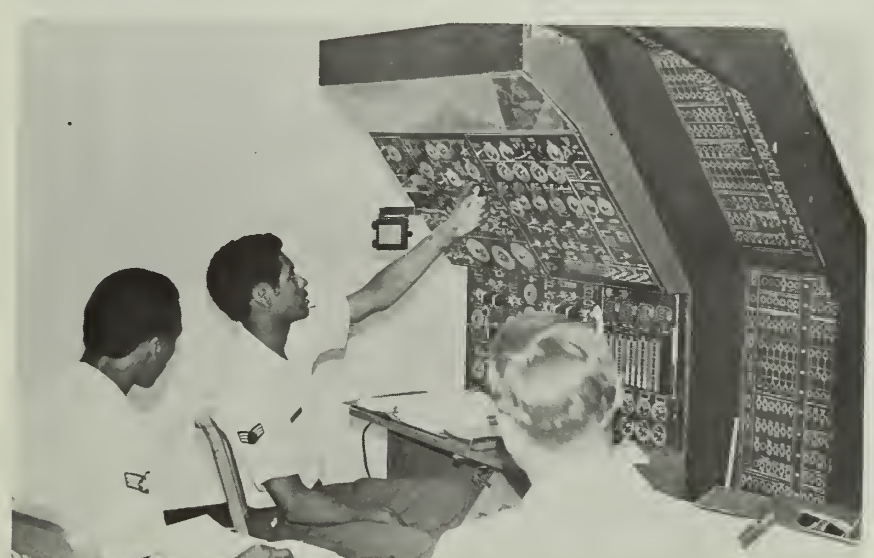
life support people have got- o the self-help act also. After ng a C-5 escape chute from e, they built a simulator plat- and modified the chute for doors. Armed with built-in ctions, the chute is used to egress skills in MAC crew- ers. The price tag included ne cost of wood, almost neg- I wonder what an Air Force ct to procure a similar device from a manufacturer would have cost? These people, like so many others I met, were extremely proud of their ingenuity and professionalism as instructors. Their pride was undoubtedly justified.

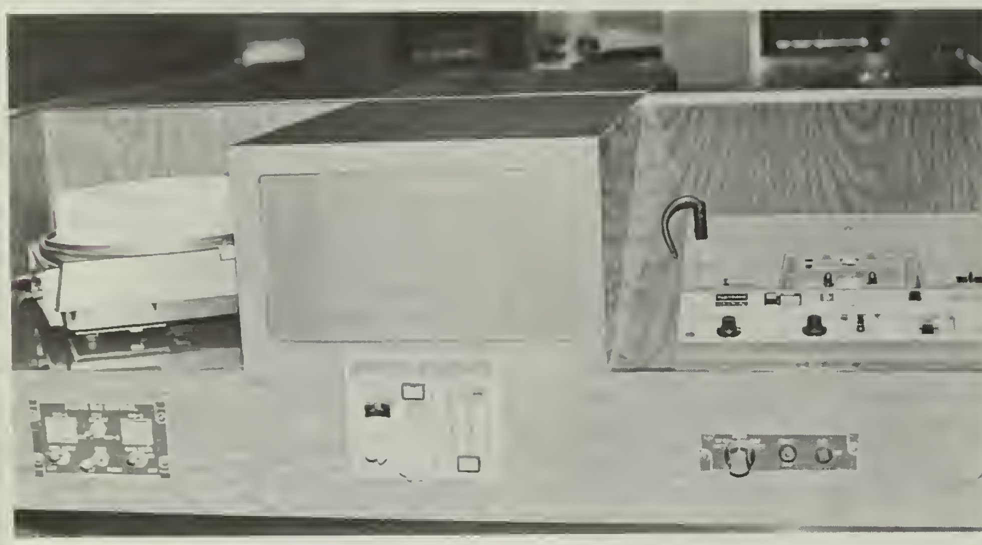
Another interesting local project involves the adaptation of a normal student learning center cubicle into an inertial navigation system (INS) simulator. The TTS electronics wizards built an INS control panel into the cubicle. Instructors then created a self-paced learning presentation which teaches the crewmember how to program and operate the INS panel. The INS was then wired so that digital readouts operated as the student followed the program and instructions. No commercially procured training aid could be more effective, yet the material cost to the Air Force, almost nothing—left over parts, an unused cubicle and a lot of free thinking and dedication.

The loadmaster training people have also contributed. Their qualification training program includes simulators which are the exact replicas of the cargo compartment of a C-5 and C-141. This equipment is used to teach loadmasters the skills of handling tons of equipment with-

The life support trainer is a locally conceived and constructed apparatus which provides students practice in using the aircraft's complex life support equipment. The escape chute, pictured above, is programmed to malfunction during primary activation efforts.

An instructor and two flight engineering students practice systems operations at the Technical Training Squadron. The instructor to student ratio allows for personalized attention during the academic phase of training.





A standard student learning cubicle, some leftover hardware, a bunch of ingenuity and presto—an INS procedure trainer. An innovative idea which has proven to be very effective, with an extremely low price tag.

Systems mock-ups help
visualize the operation of an
and identify and correct s
tions. LEFT: The C-141 land
trainer tracks the move
hydraulic fluid and electric
C-5 forward and rear ca
is a miniature replica
components. The operation
the real thing and m

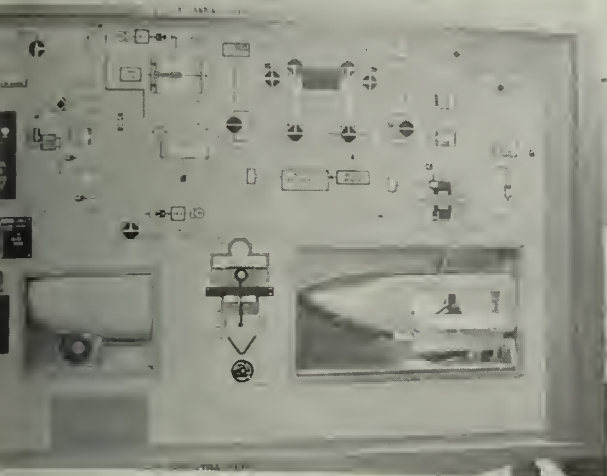
OKLAHOMA? co

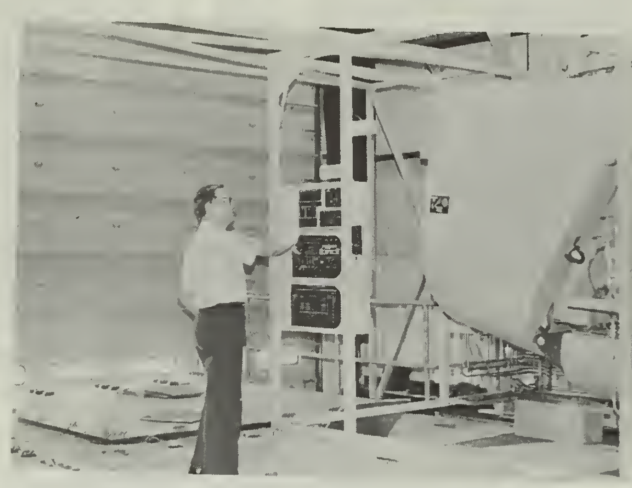
Loadmaster simulators were originally built to supplement the loadmaster qualification training program. Specifications and hardware match the cargo compartments of the C-5 and C-141. An additional use, recently initiated, is to train Army mobilization teams, thus, saving valuable aircraft time and eliminating costly aircraft damage.

out endangering valuable
during the training phase.

An alternate use, identif
developed by the loadmaste
was to use these simulat
training Army personnel in
zation exercises. They p
bringing in Army teams fr
Sill, Oklahoma, to train c
simulators rather than sendi
aircraft to them. The result,
MAC-use cost saving to th
and the avoidance of a lot
ing damage and down time
aircraft. To date, the T
worked with the Army on
ing and instructing on the lo
over 1,200 tons of equipm
vehicles. From a conservatio
sources standpoint, the savi
been substantial.

I could easily go on
about the engineer station
ups, engine displays, navigat
ing facilities, combat airdro
ing, systems mock-ups an
more. The point, however, h
made. The people there, pe
you and I, have been given
dom to try new ideas, test
incorporate what works, and
that which doesn't. The ov
sult: high esprit, a faculty
self-actualize, and a darn go
ing program.

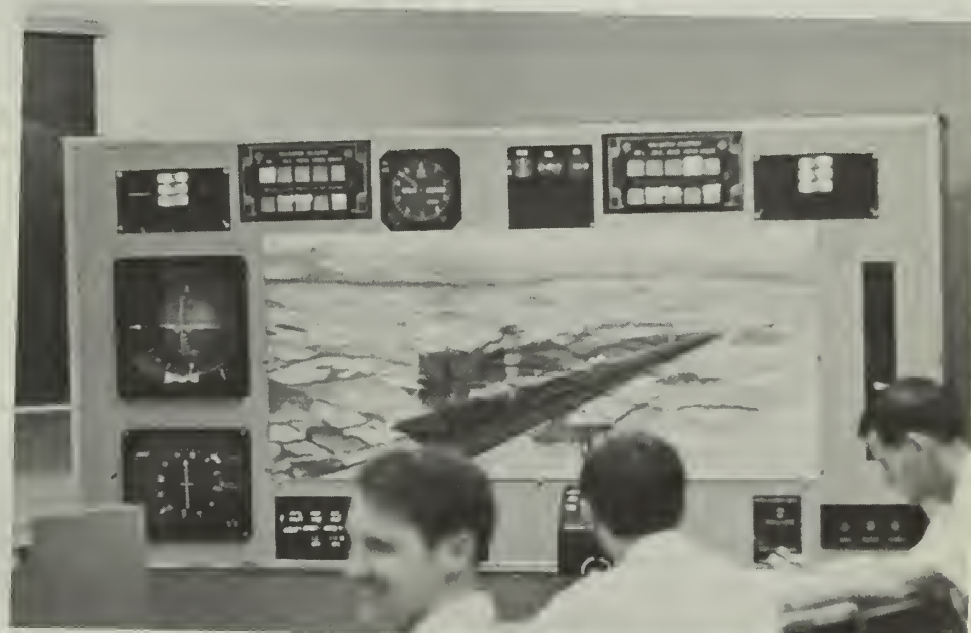




though my story stops here, the of the people at Altus AFB ich larger than I am able to re- n this article. The flying squad- and the instructors have been ly innovative in the flight and ator portions of the training am. (Editor's note: The use of imulator will be addressed in *erospace Safety* article on sim- advances scheduled for pub- on in the near future.) I found ly, motivated and proud peo- the wing staff, at Base Oper- , in the maintenance complex, e flight line, and most every- else I visited.

uess the bottom line is that Air Force assignment is a nge and an opportunity. It e as good or as bad as we, the orce people, make it. If you ich a tour emphasizing the ve aspects, the result is sure an unenjoyable tour. Empha- the positive will normally lead opposite result. ★

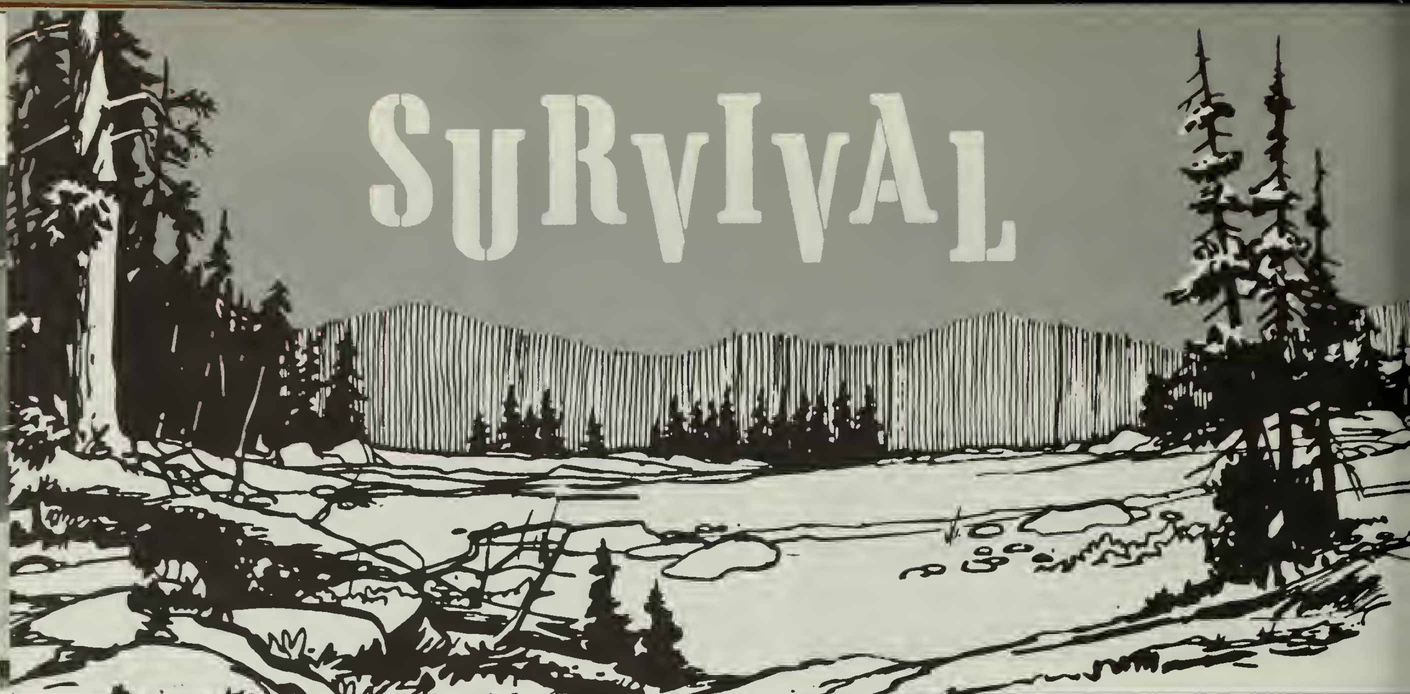
space Safety magazine and I wish k the entire wing safety staff of MAW for their help and cour- ring the preparation of this ar- t Col Edwin C. Ross, Chief of was a gracious host, and Lt Col A. Rovell, Jr., Flight Safety Of- rved well as guide, mentor, and uring my visit.



Loadmaster airdrop training is also conducted at Altus AFB. Dummy loads are loaded on pallets and rigged for airdrop delivery. The cargo loading procedures are studied and mastered on the ground prior to the flight training phase.

The pilot qualification program begins with four weeks of intensive academic training. Here, a navigation system mock-up depicts aircraft instrumentation during different phases of an ILS approach.

SURVIVAL



The Modern Eskimo

MAJOR GILBERT C. BODRAK • Operations & Requirements Branch
3636th Combat Crew Training Wing (ATC) Fairchild AFB WA

When you think of the word Eskimo, what do you visualize? An illiterate resident of the Arctic with no command of English? This may be an illusion that has been fostered for decades, but let's look at the modern Eskimo, the person who may save your life. Times have changed and this durable race has changed with it.

The basic problem for both the Eskimo and a downed crew member is survival. Basic in this sense of the word does not mean simple, at least not to the crew member. The Arctic area has had chill factors of $-150°$, food is scarce, and life is always in jeopardy. To survive in this hostile environment, one must have knowledge, determination, and a will to survive. The modern Eskimo excels in these traits—and more. His ability to survive has been judged as one of the most remarkable adaptations of man to a stringent environment.

Imagine, if you will, a bailout or crash landing in the north country. Towns and settlements are

separated by hundreds of miles. at all possible, try to delay the inevitable until you are near on of these settlements. Once on th ground and you are proceeding toward the settlement, question will arise. What kind of people can I expect to find? How will I communicate?

You will find that the moder Eskimo is a very competent per especially in the art of survival. To survive in this harsh environ ment, no one person, or race of people, can be imperceptive of t elements and the hardships that they must endure. They must b tenacious yet adaptive. The old breed of Eskimo fished from ha powered kyacks or umiaks. To he uses power boats. The old hunted and fished for food to li now they hunt and fish not only for food to eat but to have a commodity to trade or sell in lo co-ops. The dog sleds of the pa are still used for hunting and lo distance travel, but have been replaced by the snowmobile for short trips and checking local tr lines. The igloos, snowsheds, an

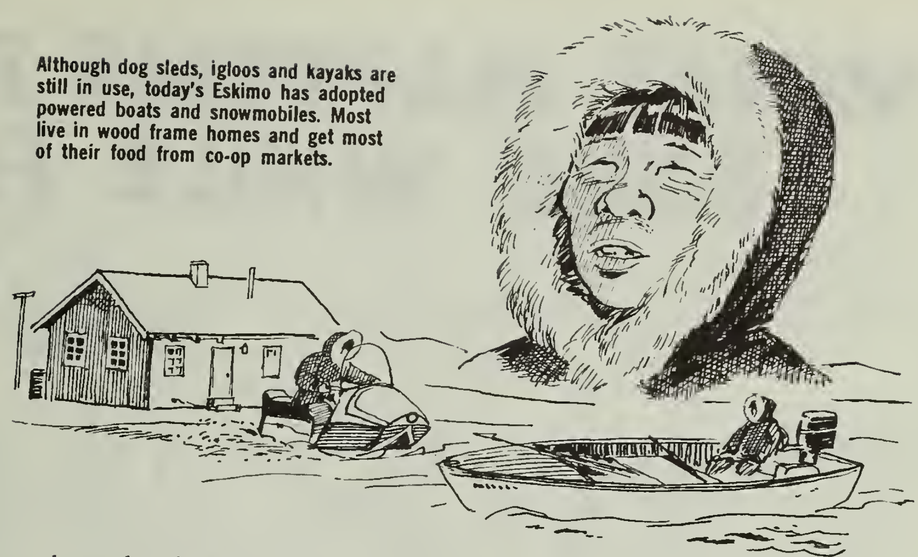
s of the past have nearly all n replaced with wood frame nes. Yes, times have changed the Eskimo with them.

he food you receive may not o your liking and may vary endent upon your bailout or h landing location. If, for ex- le, you find a coastal settle- t, your diet would consist of arily fish, seal, walrus, bear, d (if flour is available) and tea. u should land further inland, neat would be caribou, wolf, usk ox (occasionally eaten . A single Eskimo or his dog consume about three pounds od per day. Realize that this must supply food for himself his family (a typical family include a dozen people with teen or more dogs). If he ad an exceptionally good he will restock his caches and unce his success to the com- ty by yelling "come to my ."

en food is in abundance the nos, with memories of past r, will gorge themselves until ng is left. The party may last l days. You will find the e most gracious, generous, illing to help. However, don't dvantage of their hospitality. atives have little enough to eat sparingly and offer pay- when you leave. Tobacco, in rm, is not only appreciated nsidered a proper form of nt.

ough many things have ed for the modern Eskimo, at has remained fairly stan- hrough the years is clothing. ng normally worn by a d crew member is not ade- for prolonged exposure when atures are severe. The Eski- ay either make, issue, give, you a parka, trousers, and The set has the hair or fur inward and is covered with er garment of caribou skin. ttens, and boots with sealskin

Although dog sleds, igloos and kayaks are still in use, today's Eskimo has adopted powered boats and snowmobiles. Most live in wood frame homes and get most of their food from co-op markets.



soles and caribou skin uppers complete the outfit. This clothing will afford proper protection to you in even the coldest of weather, providing some form of shelter from the wind is available.

Your next surprise may be the language. The native Eskimo language is termed polysynthetic (various word elements combined to a single word that is equivalent to a sentence). Another characteristic is the elaboration of terms by adding various suffixes to a word stem to express relative age, sex, and condition of animals, condition and amount of snow, etc. The native Eskimo language, however, is verv difficult to learn and is rapidly decaying. Children in school and the younger generation are now being taught English and French. If most of the settlement still speaks Eskimo, find a child or teenager to act as an interpreter.

The greatest change in the modern Eskimo's way of life has been brought about by the establishment of a chain of co-op stores and greater employment of Eskimos in the wage market. The co-op has helped spread food to the various settlements, particularly during lean years and has given the Eskimo an outlet to sell his various commodities. It has had some adverse effects, however. Some feel that it is changing the food habits of the people in the new settlements—for the worse.

As the Eskimos get more and more cash from sale of their products in the co-op and wages (government work, logging, construction, etc.), they don't hunt and fish as much, and must, therefore, supplement their diets with purchased food. That food is not as high in protein and fat content which is so vitally needed in this cold climate, and the cost is high since supplies must be flown in from the south. The co-op, however, may be an advantage to the downed crew member.

Communication between the various co-op settlements is achieved via short wave radio. This radio system can relay your plight from village-to-village in an attempt to raise help or establish search parties for your fellow crew members. In addition, the remote settlements are supplied by air. Small aircraft fly in supplies and pick up items to be sold in the markets farther south. If space is available, you may be flown out at that time. If not, your position will be relayed and SAR efforts initiated.

Yes, times have changed and the Eskimos have changed with them. They are a modern, generous, yet tenacious race of people that have dispelled any fear of the frozen north and have learned to live with it. Your understanding of these people and their way of life may well be the deciding factor in your survival. ★

WHAT HAPPENS TO YOU EARS WHILE FLYING

LTJG HARVEY B. FIRESTONE • US Coast Guard Audiolo

Nearly everyone who flies has experienced a hiss, tingle, pop, sizzle, or gurgle in their ears. Some people don't feel any effects in their ears, while others have ears that "stop up" and become painful. So what happens, and what can you do to prevent ear problems while flying?

The problem you are facing is called barotrauma. "Baro" means air-pressure related. "Trauma" means injury. The problem of air pressure in your ears is introduced by the atmospheric heights the aircraft may travel through. The air pressure decreases when you rise above the earth's sea-level pressure of 14.7 pounds per square inch, which results in expansion of any trapped air. Your ears accommodate by trapping or releasing air in the middle ear.

Some anatomy is helpful in understanding how this occurs (see Fig. 1). The external ear is composed of the pinna which collects sounds and channels them down a semitube closed at one end by the eardrum. This is the external ear canal. The eardrum must vibrate for you to hear by normal air conduction. Sounds can only occur in a medium elastic enough (like air) for vibration of the eardrum and the three small bones—hammer, anvil, and stirrup (which, incidentally, are the smallest bones in the human body). As the medium changes, so does our hearing—ever notice how you hear under water? If wax blocks the channel, or rests on the eardrum, it naturally impedes the flow of sound and vibratory transmission. This changes the pathway, but not the medium. Inserting an earplug can quell noise by air transmission pathway reduction just as well. need air on both sides of the drum to allow our ears to func properly.

Dizziness may occur due barotrauma to the fluids and c of the semicircular canals, wh generally control our labyrintl function and affect our sense balance.

Hearing may be your only p lem. Cabin attendants may ad you to hold your nose and blow yawn very widely. This is good vice because the middle ear ne air to equalize itself. The only to provide air to the middle ea through the Eustachian tubes each ear. These tubes connect middle ear with the superior pects of the epipharnyx—up most throat region. The 19-le (count 'em) salpingopharynge muscle attaches to the pharyn

um of the auditory tube, open- and closing the flapper valve- structure when yawning or lowing. (Fig. 2.) Equalizing sure enhances sound trans- sion, resolves balance prob- s, and decreases the amount mucous membrane seepage of middle ear.

roblems arise in equalizing ssure when a cold settles in head and our ears get stuffy. is due to the swelling of the cous membrane lining of our dle ear and throat. This often nough to encompass the area and the opening of the Eusta- n tube with enough swelling to e it off and reduce the salpin- haryngeous actions of air ex- nge.

he reason ears "beep" is due ne negative air pressure suck- on our eardrums. Audiologists cialists in hearing conditions) otologists (surgeons of the who peer into an ear can see mploded eardrum—indicative middle ear problems. You can temporary, slight pain from otrauma when the ligaments ing the three bones and the rum are stretched.

ow, here is the action phase what you can do to overcome otrauma. Swallowing normally ns Eustachian tubes. Chewing eases saliva, and the conse- nt increased swallowing is ugh to induce barometric alization. This is why chewing is often given to airline pas- gers. (But it sure can "gum the valves of an oxygen k!)

awning is a completely safe hod of middle ear equaliza- but it doesn't work for every- If yawning doesn't work, you hold your nose and gently low or blow or alternate those edures until your ears clear.

You should be careful when you do this, however. If you are running a cold or other upper respiratory infection of any sort, you risk infections of the middle ear by attempting equalization by any method but yawning. An alternate —although infrequent—method of middle ear barometric equalization is to visit the otologist's office to have him pass a silver tube through the nose to the Eustachian tube and middle ear. Air is passed up the catheter to gently inflate the middle ear. This procedure is called a bouginage. For the most severe ear blocks, the surgeon is required to lance a minute hole in the eardrum (called a myringotomy).

Two ways to know if you are susceptible to barotrauma are by flying or low-pressure chamber training and trying to clear your ears. Whatever technique you find that works consistently is reasonable. But be careful. Blowing those eardrums outward from their inward position too many times will cause your eardrum to weaken by stretching. The strained ligaments of the ossicles may cause pain. Your hearing may be temporarily dulled, or if there is enough pressure, you might blow a hole in your eardrum.

So be gentle on yourself. You may be able to equalize one ear only with one technique, while holding the nose and swallowing, or yawning works fine for the opposite ear. The best advice, of course, is not to fly at all when you have a stopped-up head and ears.

Good luck and happy flying. If you have an ear block now and can't hear, at least you can read! —Courtesy **Approach.** ★

FIGURE 1
THE HUMAN EAR SHOWING PORTIONS AND STRUCTURES

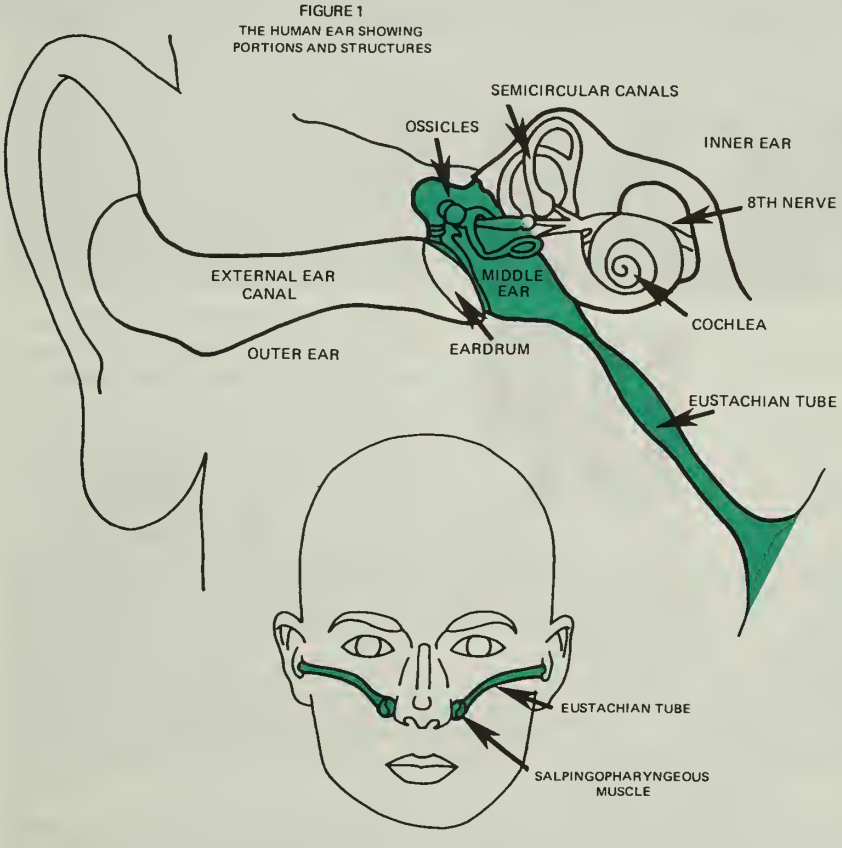


FIGURE 2
SALPINGOPHARYNGEOUS LOCATION AND EUSTACHIAN TUBES

GEAR UP

(WINGS DOWN)

LT COL WARREN R. HORNEY
Directorate of
Aerospace Safety

United States Air Force Aero Clubs periodically experience the traditional gear up landing of a retractable gear aircraft. And the last 12-month period has been no exception. We had the classic "couldn't hear the tower for the horn blowing" and even had one involving a Piper Arrow with the automatic gear extension system (they said it couldn't be done). However, of more interest are a series of mishaps involving Cessna aircraft which have the gear welded into the down and locked position. In each of the cases listed below the aircraft ended up with the wing low (on the ground) and the gear up—pointed straight toward the sky:

A pilot on a cross-country flight became disoriented while flying above the overcast. He had not received a weather briefing. When his fuel supply ran low (he hadn't refueled prior to takeoff either), he descended through a break in the overcast and landed perpendicular to the furrows of a plowed field. Result—aircraft up-side down.

Another pilot was unable to find his destination because he h neglected to apply a fairly significant crosswind factor to his planned headings. He finally reversed course to return to the ho field. Although the fuel gauges showed a low fuel condition he chose to press on, relying upon th owner's manual endurance figur Eventually the engine quit, and after attempting to run the engin on the primer, the pilot made a partial flap landing in a rice padd The nose gear dug into an embankment and the aircraft came t rest inverted.

A student pilot on initial solo was cleared to land on a sod runw

nd of the hard surfaced run- from which he had taken off. mistakenly landed in a green adjacent to the desired run- allowed the nose wheel to n, and the result was a low high gear Cessna 150.

nally, a private pilot flying model Cessna 172 got into poise when he forgot to lower and touched down fast and low. After a series of bounces creasing amplitude, the nose failed, the prop dug into the ay, and the aircraft did an mely tight outside loop to the s-up position.

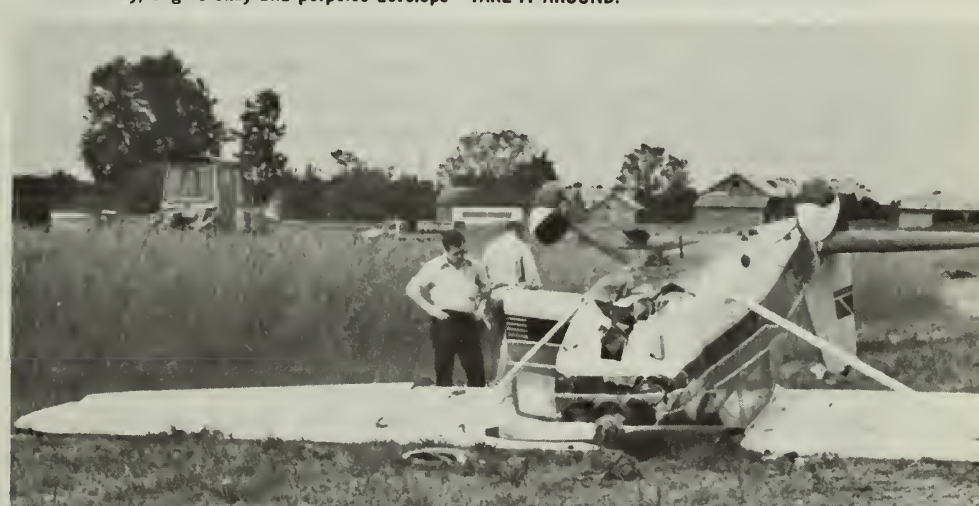
ost incredible of all, in one above cases the aircraft was ed, the prop bent back to -or-less straight, the rudder nered free, and the machine to a nearby airport for repair. was some tough Cessna.

hat can we as aviators (and student pilots are aviators) do ep the wings up and the wheels ? First, we can avoid forced runway landings. Good flight ing, timely precautionary land- t an airfield when things o go bad, and heads up flying liminate most forced landings. ever, every light plane pilot d be prepared for the time the fan quits or some other gency makes an off-field ng mandatory.

's discuss briefly how we can gracefully terminate the flight nds in a big bounce on a y or a forced landing off the y.

st, there is really only one ul way to get out of a por- go-around. The conventional nse to a developing porpoise- or up as nose falls and ele- down as nose rises usually is er-productive since the eleva- sponse is insufficient to coun- the motion in the time ble before the next bounce—

Scenes such as these often result from poor flight planning and poor judgment that lead to off runway landings. Technique is also important. Every pilot should know soft field landing procedures. On the runway, engine okay and porpoise develops—TAKE IT AROUND.



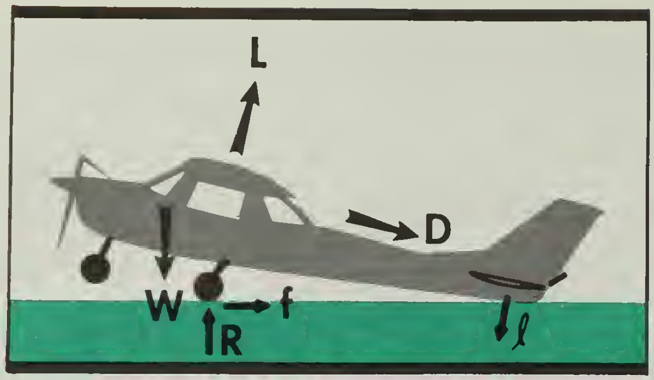


Figure 1

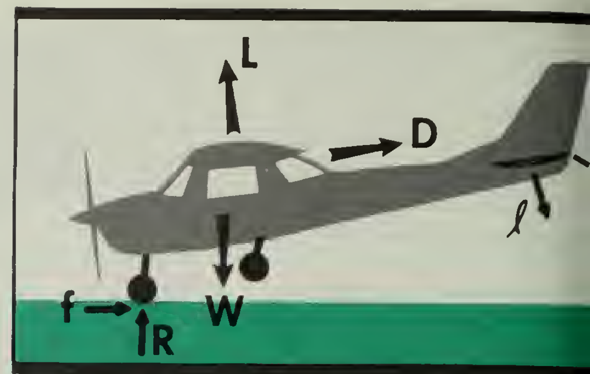


Figure 2

GEAR-UP continued

so you must neutralize the elevator, add full power, and go-around. By the way, don't forget to retract the flaps to the appropriate position after you get the aircraft under control, or you may end up in the trees off the far end of the runway. (Yes, that, too, has happened to an Aero Club pilot in the recent past.)

But what about the real forced landing with all the trimmings—engine dead, field rough or soft (plowed fields are designed to be soft), but at least we have a field identified? First, let's set up a good pattern so that we hit our key points while we prepare for the landing—radio call, mixture cutoff, fuel off, throttle closed, ignition off, doors unlatched. Now we come to the critical part—the final approach and touchdown. Remember that maneuver we learned during private pilot flight training—the soft field landing? Now is the time to do it for real—let's get full flaps down (then turn off the master switch if you have electric flaps) and get the airspeed down to full flap final approach speed. Now as we flare for landing, let's use the soft field technique of holding that nose high attitude as long as we can so that the aircraft touches down at minimum airspeed (you'd be surprised how slow that really is). Then, after touchdown, hold full up elevator until the aircraft comes to a stop. You can now deplane and start preparing your "There I was . . ." remarks for the locals—much more appropriate than trying to decide what's going to happen when you release that seat belt (and hopefully shoulder harness) that is suspending you upside down.

Why does the full flap, soft field landing increase the probability of remaining upright? For several reasons. First, you land at a lot slower airspeed and have less momentum to dissipate. Secondly, you keep the nose wheel (and prop) from digging into the ground and causing your translating aircraft to become a rotating body. Third, a look at Figure 1 shows that you have the lift (L) and drag (D) forces working in your favor—keeping weight off the wheels and slowing you down. When you dump the nose you lose most of your lift, thereby putting the weight on the wheels (including a significant portion on the nose wheel). You also lose a portion of the drag which opposes the nose-over (Figure 2).

So, why would anyone make a partial flap, high-speed landing in an actual forced landing? Because that is the way most people land most of the time. If you don't believe it, spend a Sunday afternoon at the local aerodrome watching light plane landings.

What should we do? Practice Practice 180° and 90° power of landings until you can land whe you want every time. Practice soft field landings until you hav confidence in your ability to kee that nose wheel off the runway an absolute minimum airspeed. *club rules allow,* and a sod or di runway is available, make some landings there so you aren't intimidated by a runway or field l than 10,000 by 150 ft. Needles say, student pilots shouldn't do above until cleared by their instructor.

In summary, let's follow the f P's for avoiding wheels up landi

PLAN ahead. A good fligh plan, weather briefing and preflight preparation will keep us out of a lot of trouble.

PREPARE for eventualities. Take action when things start to bad. Have a backup plan, and a fall back from that. A precautionary landing is almost always a good idea.

PRACTICE. Nothing build confidence and skills like practic Have confidence in your abilit to make a successful forced landi when the occasion arises.

PERFORM. If you have to make a forced landing, keep you wits and make a full flap, soft fie landing that preserves both the aircraft and your pride.

Let's keep the wheels on the ground and the wings in the sky.

HOW TO FAIL SPECTACULARLY

ART PERRAULT

e hear a great deal today about the laws of success, and self-help books are a booming business; but how about our right to fail? Is there ntific method to ensure failure? We know that nly way to become successful is on purpose, but ossible to be a failure on purpose? An exhaustive taken recently disclosed the fact that only 3% Americans are "outstandingly successful," that are "moderately successful" and 29% of our are "complete failures," achieving nothing.

tramps were sitting on a park bench discussing onomic situation, and one said to the other, "This sion don't bother me none . . . I was a failure the boom." How can we guarantee our failure luring times of unprecedented prosperity?

3e a drifter—avoid like poison any short-range, ediate, or long-range goal. The Wall Street Jourced with the complaint that high taxes make it sible for anyone to rise from rags to riches today, a study that disclosed there have been more new aires starting from nothing in the past decade any other period in history. These people were ferent in many ways except that they were de- So rule number two for failure is:

rocrastinate—they even have a slogan for Proation Week: Don't Put It Off, Procrastinate To-

ther good method is never to do today what you t off til tomorrow. If you get a sudden urge to now" just sit down until the mood leaves you. earch conducted by Columbia University disthe amazing fact that it is not aptitudes but es that make us successful. 93% of our success is attitudes and 7% is skill and knowledge. So failure rule number three is:

• Be negative—you can catch more flies with honey than with vinegar, but who needs them? If you want to be successful, think success. So if you want to be a failure, think failure.

• Be a poor communicator—be a poor listener; even a fool is considered sensible when he keeps his mouth shut, so yak up a storm and remove all doubt.

All of our actions are consistent with our inner opinions about ourselves. The picture that we have inside about ourselves, whether it is true or false, determines what we can or cannot do in life. So rule number five for failure is:

• Sell yourself short—remind yourself constantly about all of your weaknesses, shortcomings, and past failures . . . and don't forget to tell others. Be a blob.

The biggest problem facing management is motivation. So failure rule number six is:

• Fizzlemanship—when you get that "hot button" urge to achieve, fizzle!

Worry prevents our doing the very thing that would remove the worry. So failure rule number seven is:

• Be a worry wart—a neurotic is a person who worries about things in the past that never happened, unlike the normal person who worries about things in the future that never happen! If you run out of things to fear, you can fear fear itself!

How do we fail in life without trying? The answer is in failure rule number eight:

• Don't try—if at first you don't succeed, forget it! Everyone is a self-made man, but only the successful ones admit it.—From the "Chaplain's Message," *Jet Stream*. 22 Jan 78, published by 150 TFG, New Mexico ANG. via *TAC Attack*. ★

If your bird is reluctant to fly, you may be having a . . .

HEAVYWEIGHT BOUT WIT

DENSITY ALTITUDE

Those heat waves making the runway look like a lake ought to be telling you something: it's Summer and time to think very seriously about DENSITY ALTITUDE. One of the first things you notice is that your bird seems reluctant to fly. But don't start blaming the engine(s), air will be the problem. Heated, it starts to rise and expand.

Air, a mixture of gases, occupies space and has mass; therefore, density. Density, or the concentration of molecules, determines the ability of air to support. The thicker, more dense it is, the greater its support capability. Air density is affected by three main factors: temperature, pressure and humidity. Of these, temperature and pressure have the most adverse effect. When air undergoes a drop in pressure or a rise in temperature, expansion takes place and the air molecules move away from each other. Air density decreases and so does its ability to support. The reverse holds true if pressure rises or temperature decreases. Humidity has a similar effect as moisture displaces air, making humid air lighter or less dense than an equal volume of dry air.

This relationship of pressure, temperature and humidity of air establishes density altitude. For practical purposes, we can express density altitude as the relative altitude or load-lifting ability of air as it expands and contracts. At times, this expansion and contraction seem unbelievable. At one Army post, for example, the actual elevation ranges from 300 to 500 feet above sea level. Depending on weather and time of day, the density altitude may vary from minus 1,000 feet to plus 4,000 feet. Consider that a UH-1H at a gross weight of 9,500 pounds can clear a 50-foot obstacle with a zero ground run (vertical takeo under standard (15 degrees C.) sea level conditions. With a tem perature rise to 35 degrees C. t aircraft will require a takeoff distance of 255 feet and an air speed of 20 knots to clear the same obstacle.

Since lift is not only depend on the shape of an airfoil and angle of attack but also on the mass of air causing the lifting force, as density altitude becom greater, lift decreases. In helico ters, high density altitude has t same effect as loss of rotor rpm. For example, power trains can b overtorqued, reciprocating engines can be overboosted, and autorotations can become espe cially critical when pilots attem otherwise normal maneuvers un der high density altitude conditions. (The Air Force has no helicopters with reciprocating e

es, but the O-2 and aero club
es are all recips.)

ow density air (high density ude) also affects engine per- nance. High humidity alone cause a reciprocating engine se as much as 12 percent of ated brake horsepower. Since reciprocating engine operates a fixed displacement, all air essed is directly associated combustion. If water vapor rs the induction system, the unt of air available for com- ion is reduced. Since most uretors do not distinguish r vapor from air, an enrich- t of the fuel-air mixture takes e. Any increase in inlet air perature permits the carbu- to further enrich this mix- Since the maximum power ut at takeoff requires a fuel- atio richer than that for max- n heat release, still more en- ment takes place—and power ces. The end result includes power settings and increased consumption.

hile the volume of air flowing gh a gas turbine engine may in constant at high density des, this thinner air contains mass, and thrust (power) is A temperature of 100 de- F., for example, reduces the t of a gas turbine engine by ximately 15 percent from under standard conditions degrees F.

ring hot weather, density de changes are rapid, fre- and great. The load you ff with at dawn may well be d the capability of your air- an hour later. Density alti- must not only be computed keoffs, but also equally im- nt, for destination landings. s particularly true if you are off from a low altitude and o land in high terrain. And, particularly, extra caution is a must for autorotations.

With this in mind, your aircraft will do all it is asked to do and come home safely even on the hottest day if you (1) compute density altitude BEFORE weight and balance, (2) always assume density altitude to be higher than it probably is, (3) study your Dash One density altitude tables, and (4) act accordingly. (Adapted from **US Army Aviation Digest.)** ★

300,000 SAFE

Col H. W. Miller, R, 14FTW Wing Commander, greets Capt Stan S. Tada, L, and 2d Lt David R. Fink, Center, after they flew 300,000th accident-free hour.

Anyone out there who went through pilot training or worked in maintenance at Columbus AFB, MS, since 1969? If so, your assignment there made you a part of a very significant achievement which culminated on 3 April 1978. When Captain Stan Tada (IP) and 2d Lt David Fink (Student) landed TWEET 90290 they recorded the 300,000th accident-free flying hour in T-37s at Columbus. This achievement was the result of outstanding effort by everyone associated with the T-37 operation at Columbus since July 1969 when the UPT mission was assumed. That's nine years of professional performance by aircrews and support personnel backed by superior supervision.

The 300,000 flying hours equates to about a quarter of a million sorties, most with student pilots flying the aircraft, and approximately 2½ million maintenance manhours that have been accomplished correctly. All of those who have been associated with the 37th FTS and Columbus AFB can be very proud of the organization—and its outstanding flying safety record. ★

OPS TOPICS

BELTS COULD HAVE PRE-VENTED FATALS

A CH-53 was engaged in external load training when the aircraft starte to experience excessive "collective bounce" and to depart controlled fligh The AC took control and called for the crew chief to jettison the load During subsequent gyrations, the crew chief and flight mechanic were bot thrown from the aircraft. The mechanic was relatively unhurt, but the cre chief was struck by the main rotor and was killed. In violation of all regu lations and good common sense, neither of them was utilizing any type c restraint, i.e., lap belt or gunner's belt.

OXYGEN CONNECTOR

An A-10 flight was climbing through FL 220 when the chase pilot notice that the pilot of Lead was having difficulty maintaining aircraft contro Passing FL 270, Lead stalled. It appeared to the chase pilot that Lead wa disoriented. He did not respond to radio calls on FM or UHF. The aircra recovered and went into a series of climbs, stalls, and dives. The chase pilo continued to talk to Lead, urging idle power and appropriate turns. At abou 12,000 feet, Lead regained full consciousness and complete control of th aircraft. He then checked his oxygen system and discovered that his oxyge mask hose had become disconnected from the CRU 60/P connector. Afte reconnecting the oxygen hose to the CRU 60/P, the pilot checked the cor nection by tapping the hose and it again became disconnected. He the firmly reconnected the hose and visually confirmed that the locking pin were seated in the locking grooves. The mission was then terminated ur eventfully.

ELECTRICAL HAZARD— KC-135A

A parachute hanger bar with parachute attached dislodged from the rac and punctured the vent screen of an aux pwr panel located behind the ai craft galley. One end of the hanger bar was lodged against "A" and "C" phas external power circuit breakers shorting the two together. The parachut shoulder harness was partially fused to the hanger bar. Minor damage wa sustained by the connecting wires. Lesson: Don't hang chutes near the au power panel.

KC-135 BOOM SCRAPED

Mission was scheduled as a night AR and RTB. The student pilot was mak ing the takeoff when he inadvertently actuated stab trim. Actuation occurre shortly after S1 (113 kts) and prior to rotation (140 kts). Neither pilo noticed trim wheel movement until the aircraft rotated despite forwar yoke pressure. The IP took control of the aircraft, noticed trim wheel turn ing, applied nose down trim, forward yoke pressure, and continued take off. Crew was not aware that an over-rotation occurred. Mission was con tinued without incident. Trim switch operated normally for the entire mis sion. Maintenance post flight inspection revealed a scraped boom. Painte trim markings on the trim wheel were obscured. Good item for pre-takeof briefings to get all eyes in the front to watch for unusual occurrences. ★

Why Flight Safety?

st June we published some thoughts on safety by Squadron Leader Peter Barratt of the Royal Air Force. Then we ran across the article below, author known, extracted from the Royal Malaysian AF "flight safety bible." It appeared the RMAF *Flying Saf*ety magazine. We think it one of the best expressions the role of *people* at various levels in mishap prevention. We chose to title . . "Why Flight Safety?"

he aim of the flight safety program at all levels is the elimination of costly accidents h directly affect the operational bility of the RMAF. Personnel material losses resulting from lents constitute an unacceptable on the vital resources on h the nation depends for its rity.

ne primary concern of the flight y program is not safety for y's sake alone. It is recognized there are certain inherent haz- in service aviation: hazards h must sometimes be accepted e interests of mission accom- ment. However, recognition of hazards does not dictate their acceptance; rather, their rec- ion should serve to indicate exactly just where the major safety preventive effort should rected.

cause operational effectiveness mission accomplishment is the nander's prime responsibility, onus for flight safety must, fore, rest personally with him. t safety is thus a function of nand. The commander, in turn, use of the complexities of mod- ircraft, must rely on his various ical, administrative, and executive staffs for expert advice. Thus these supporting staffs also become directly and intimately involved in all aspects of the flight safety program.

It follows then that flight safety (accident prevention) is not one person's responsibility; rather, every person connected in any way, however remotely, with the aircraft operation must share in this responsibility. The designer, manufacturer, engineer, supply officer, maintenance organization, ground support elements, and aircrew must all contribute in their own specialty to the end that costly accidents do not occur.

The causes of accidents originate in a variety of ways, ranging from an incorrect statement of the operational requirement, through design, production and development, to operating and maintaining the aircraft in service. They also originate in the training of aircrew and ground crew and the operational risks which are inherent in service flying. The great majority, however, can be traced to human fallibility. In the service this can be countered by higher professional standards in flying, servicing, administration and staff work, and by high morale; all these are products of inspired leadership. It is, therefore, commanders at all levels who can do most for flight safety. Furthermore, the commander is responsible for operational efficiency, so he must be responsible for the implementation of flight safety.

Experience has shown that the establishment of a flight safety organization is necessary to keep accident rates low. Such an organization must be advisory and not executive. Flight safety is a means of achieving operational efficiency and is not an end in itself.

To be effective, a flight safety organization must be independent of executive branches and be of equal status to them, and be directly under or have right of access to the commander. To be efficient in its task it must have an adequate system for reporting, investigating, collating, study and analysis, and for exchange of accident data. It must be able to advise on accident risks, seek potential causes, suggest remedial action and publicize accidents and their causes so that all may benefit from the experience of the few. Thus, flight safety does not run counter to the operational aims of the service, rather it enhances mission capability. ★

AIRCREW JUDGMENT-- NOT GONE OR FORGOTTEN

CAPTAIN DAVID V. FROEHL
Directorate of Aerospace Sa

Those of us who have flown airplanes for a few years have, at times, become in- volved in discussions of the amount of written guidance "a able" to aircrews. These same discussions have invariably had least one voice which cried alo "They're taking away all of the judgment by the aircrew." I TA EXCEPTION!

Maybe it's time to think abo our vast array of flying rules, regulations, and restrictions in new light. We tend to think of numbers and limits only in term of maximums or minimums. M imums are usually figures base on equipment limitations and m imums are based on safety mar gins. Only rarely does a regulati contain a "recommended" or " timum" figure. Due to this lack of "optimums," more judgment required by the aircrew than ev before. Let me illustrate with a discussion of maximums and m imums.

MAXIMUMS

These "highest allowable" numbers often take the most hit during hangar flying sessions. I submit that, deep down, we all know that a maximum exists for a reason, whether it is based on safety margin, equipment life or body life. Crew duty day, for example, is defined in terms of a "maximum" number of hours for which a crew member may

rm duty. It seems only com-
sense that two or three hours
veather busting" takes more
f a pilot than the same time
d of auto-pilot droning. By
ame token, if a loadmaster
been through the bag-drag
for several hours, he is
itely more mishap and injury
e than the individual fresh
e job. A "maximum flight
period" is just that! The
ment of the crew member
precedence. If circum-
es reduce efficiency because
traordinarily demanding con-
ns, it is the responsibility of
iduals to determine their own
onal maximum crew duty day.
60-1 states: "Aircraft com-
ders will terminate a flight
safety may be compromised
tigue factors regardless of
duty periods authorized."
hear it now. "Boy, my ops
r would tack me on the wall
rminated the mission early
use I thought my crew was
red to press." Don't you be-
it! Every commander and
visor I've known would much
r take an honest shot in the
tics and have to explain a
ed or cancelled mission than
to explain a mishap or notify
of-kin.

rcraft limitations are another
mes attacked subject in
ssions at the "ol' watering
" The typical comment is:
been having over-Gs (you
substitute any number of
opriate limitation excursions)
I started flying and never
d the wings off one yet. . . ."

This is another area for aircrew judgment and responsibility. If the aircraft has a Dash One "G" limit of +6.0, that's a maximum! If the mission requires pulling the pole, do it! If the extra Gs aren't necessary, the name of the game is equipment life. This philosophy should apply to all phases and types of operation. Engine and airframe life are a function of how you, the aircrew, use the equipment. The point—maximums are there to be used only when mission requirements dictate. It's the responsibility of the aircrew to use judgment in the determination of aircraft (and equipment) usage versus mission profile.

MINIMUMS

This is another area which definitely requires judgment! Minimums of various types are found in 60-16, approach plates, Dash One's and any number of other publications dealing with aircraft operations. Minimums are (again) just that! They are the lowest figures which have been calculated to provide a required safety margin for equipment operation, aircraft performance or aircrew survival. Aircrew members need to keep this rationale in mind when dealing with "minimums." Circumstances may cause those figures to be too low for your particular situation. Again, hopefully, common sense takes over for the crew having electrical fluctuations at altitude and facing either their 500 and 2 destination or VFR alternate. Sure, the weather is above minimums but to me, that VFR alternate is the place to go if you have any hints of electrical gremlins. Judgment is the real name of the game. Lots of folks have bought the farm because of too much pride to go to an alternate when things are going sour. Press-on-itis will catch up to you eventually. I can't say it loud enough—minimums are **minimums!**

Every day there is always one message in the stack of Class A, B, or C's that shouts "lack of judgment, they pushed too hard or too far." We tragically lose several folks every year who stay with a sick air machine until below ejection minimums. If your Dash One says "2,000' minimum controlled ejection altitude," would you stay with a dying bird to descend from your present 3,000' down to 2,000'? This is a judgment call which deals with life or death in many cases. Minimums may need to be adjusted upward if the situation dictates.

Whether you're dealing with a transport or air-to-mud mission, a healthy or not-so-healthy machine, or a single-seat versus multi-place aircraft, safe and successful mission accomplishment requires continuing judgment. Don't let untempered reliance upon minimum or maximum numbers turn you into a statistic! ★

Figure 1

Hail encounter distribution from a study conducted some years ago. Each encounter caused damage to aircraft.

HAIL HAZARDS

When modern, high-speed aircraft encounter hail in flight, it is well known that the results can be quite unsettling. And we are in the midst of the US hail season. The number of aircraft encounters with hail is highest from June through August, and the main concentration is in the South and the area between the Mississippi River and the Rocky mountains. Of course, you can tangle with hail any time in the year, but if you get past September, the odds are way in your favor until March in the South and Southwest.

Now, we don't wish to belabor the fact that hail and aircraft don't mix, but we would like to elaborate a little on the kinematics of hail-producing thunderstorms and some of the things flight crews can do to avoid sustaining expensive or possibly even pernicious damage.

Hail can form in cumulus and cumulonimb clouds with strong, rising convective currents i similar manner as ice forms on aircraft; that when a solid object with a surface temperature (or below) the freezing point of water comes in c tact with supercooled water droplets which free the object undergoes ice accretion. The birth o hailstone occurs when a supercooled drop combi with certain kinds of dust particles or by collision the drop with an ice particle. Hailstones thus gr in the updrafts of convective clouds by sweepi up supercooled droplets above the freezing lev While a hailstone is growing in such an updraft, always falls at its terminal velocity with respect the air: the velocity at which the wind resista keeps it from accelerating. When the velocity of t updraft equals the terminal velocity of the hailsto

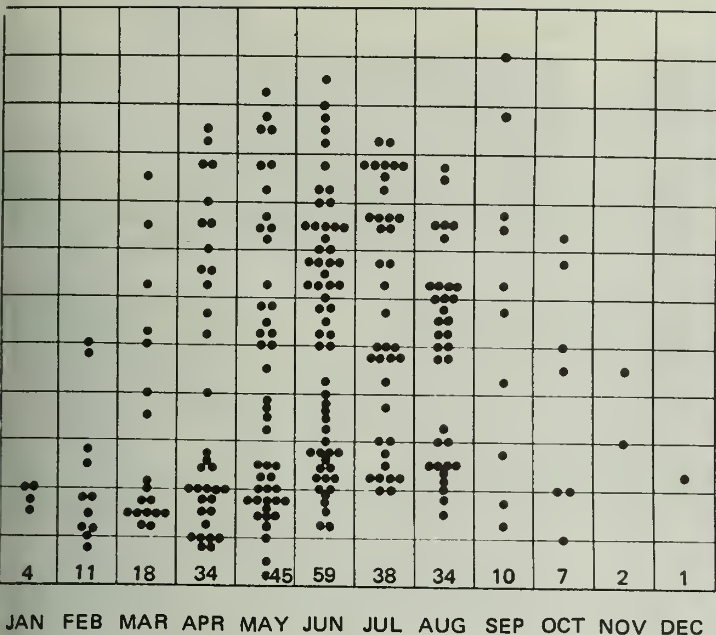


Figure 2

C-141 radome destroyed in encounter with hail.

ailstone remains at a constant altitude until
odraft velocity changes or it grows larger (thus
sing its terminal velocity).

magnitude and direction of these updrafts
ause the hail to be ejected from the top or
of the storm, which of course presents a haz-
an unsuspecting flight crew. It has been com-
that the ejection of hail would be at the alti-
vhere the horizontal flow overcomes the force
ical motion (shear zone). The direction of the
low above the 500-millibar level in conjunction
ne location of the shear zone may help to iden-
e side where the hail fallout occurs. In plain
ge, this means that flight crews should avoid
les of the thunderstorm cell and not fly under
vil top—especially on the downwind side. As
eral rule of thumb: If possible, get no closer
2 or 3 miles in any direction of the intense
erstorm radar echo and remain 10 miles away
he downwind side. Without radar, try to stay
t that far outside the cloud.

ummary, hail will form when the following
ons are met:

he cloud must grow sufficiently far above the
eezing level to produce ice particles.

he cloud must contain sufficient quantities of
upercooled water droplets and strong updrafts
allow the ice particles to grow to hail size.

ailstones form only when a quantity of the
rge supercooled droplets, which occur in cumulus type clouds, are carried to altitudes well above the freezing level. These droplets freeze to form the nuclei for hailstones.

T-39 intake appears to have been attacked with a ball peen hammer. Note damage to leading edge of horizontal stabilizers.

Although these are necessary conditions, they are evidently not sufficient because not all such clouds produce hail. A final note, however, to those who are flying in and around thunderstorms: never assume that a particular storm cell is free of hail. (Adapted from **Air Safety Review**). ★

CAPTAIN

William W. Hillman

FIRST LIEUTENANT

Clyde M. Russell, Jr.

67th Tactical Fighter Squadron

On 24 November 1977, Captain Hillman and Lieutenant Russell were lead of a two-ship formation of F-4C aircraft. Shortly after takeoff, the wingman's aircraft experienced problems and was escorted back to home base. During the landing phase, Captain Hillman attempted to lower the gear, but the left main gear remained in the up and locked position. Checklist procedures were employed to extend the gear, but all efforts failed. An attempt was made to raise the gear using the emergency retraction procedures outlined in the checklist, but despite all attempts, the nose gear and right main gear remained down. The crew was now faced with only two options: ejection or landing under less than favorable conditions. They decided to try an approach end cable arrestment. The runway was foamed as a precaution to reduce the possibility of fire. Captain Hillman and Lieutenant Russell discussed all the aspects of the landing to include ejection parameters, the possibility of a cut cable or hook miss, and emergency ground eg
After lowering the hook, a low approach was fl
to observe the foam pattern, and they decided to
a 17-unit half-flap approach so that an attempt co
be made to keep the left wing off the ground u
cable engagement. A perfect touchdown 250
short of the cable and in the foam pattern was ma
resulting in a successful cable engagement. The d
chute was deployed, and the throttles and ma
switches were turned off to further preclude any
possibility. The aircraft came to a stop at a 30° an
from the runway heading with the nose gear and
wing tank off the runway. Aircraft damage was limi
to the left external wing tank. Captain Hillman a
Lieutenant Russell displayed exceptional skill,
tailed system knowledge, and outstanding crew
ordination in analyzing and overcoming this in-fli
emergency. Their timely actions and professional s
possibly saved a valuable aircraft. WELL DONE!

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TATES AIR FORCE

Vell
Done
Award

sented for
ding airmanship
professional
mance during
rdous situation
d for a
nt contribution
to the
tates Air Force
ent Prevention
Program.

Top Row, L to R—SSgt Robert E. Wright, Jr., MSgt Roosevelt Williams, SMSgt James A. Copeland, SSgt Karl S. Freienmuth, 1st Lt Israel S. Yarchun. Bottom Row, L to R—Capt Ronald Pregmon, Capt James W. Thompkins, Capt Robert T. Brown, Capt Chester J. Trosky, Jr., 1st Lt James E. Colotta.

CAPTAIN

Chester J. Trosky, Jr. and Crew

53d Military Airlift Squadron
Norton Air Force Base, California

On 31 October 1977, shortly after liftoff, Captain Trosky, aircraft commander, and crew were faced with an extreme emergency when their C-141 aircraft experienced massive failure of the number three engine. The ejected turbine parts penetrated the number four engine, causing it to seize immediately. The parts also penetrated the fuselage wall, igniting the cargo. Operating without numbers three and four engines, at low altitude, and in an unfamiliar environment, they successfully suppressed the cargo fire and made an otherwise uneventful landing. The skillful handling of the critical situation by Captain Trosky and crew, their rapid appraisal, and prompt and positive actions throughout this emergency are a tribute to the dedicated professionals they have proven themselves to be. WELL DONE! ★


U.S. AIR FORCE

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ADVANCED EJECTION SYSTEM

AFRES:

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SAFETY SEPTEMBER 1978

Project Checkmate: testing for potential conflicts

SEPTEMBER 1978

UNITED STATES AIR FORCE

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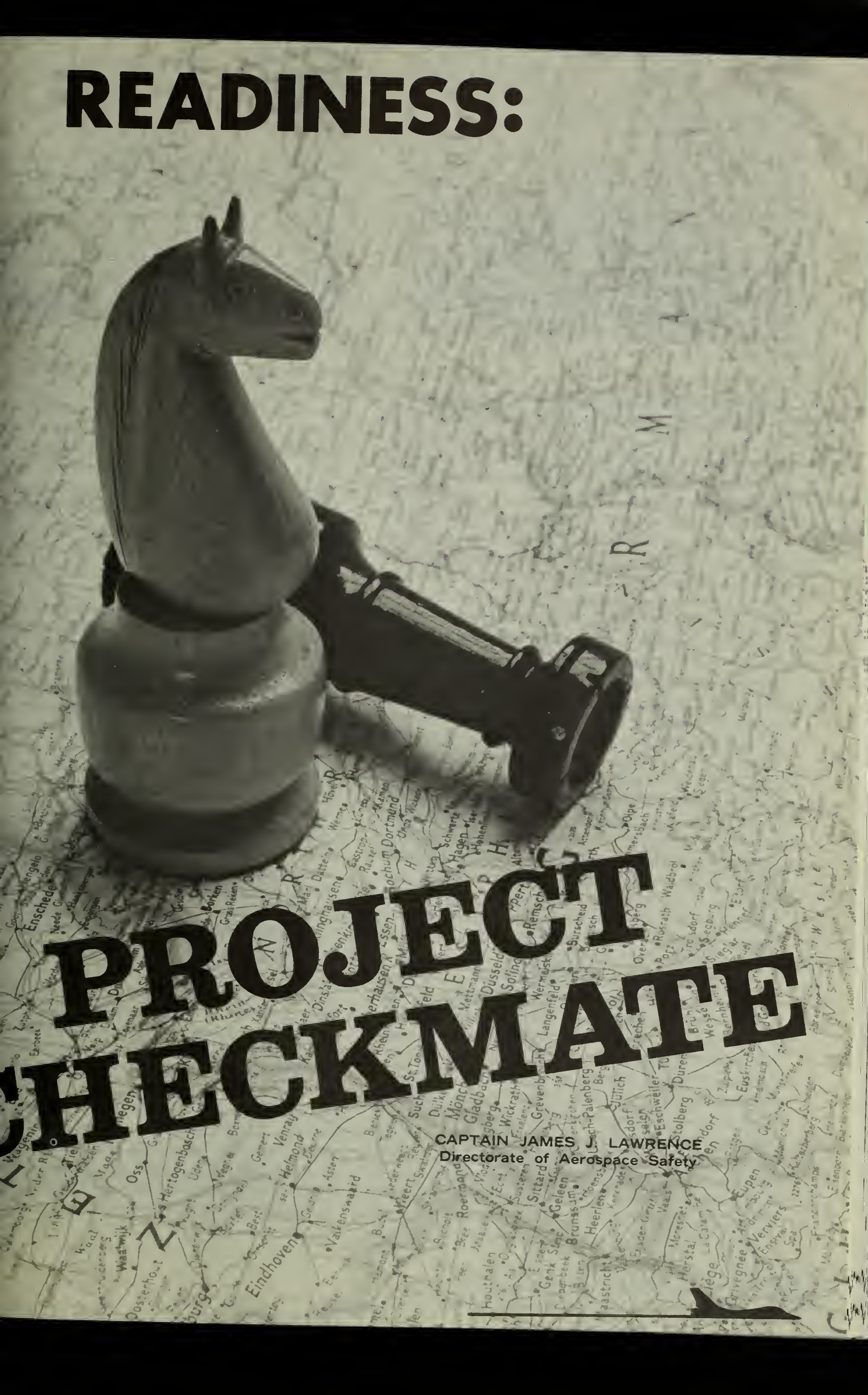
SEPTEMBER 1978 AFRP 127-2 VOLUME ~~35~~ 34 NUMB

READINESS:

PROJECT CHECKMATE



CAPTAIN JAMES J. LAWRENCE
Directorate of Aerospace Safety

General David C. Jones, former USAF Chief o
now Chairman of JCS, during one of his fr
visits to Project Checkmate, located in the ba
of the Pe

Soviet command control was studied in-depth
Red Team. They concentrated on identifying pr
which would limit military cap

READINESS, according to General David C. Jones is "the intangible lacing that takes modern aerospace systems, spare parts, fuel and other support items, training programs, and motivated, talented people and ties these elements into an EFFECTIVE FIGHTING FORCE." Readiness, therefore, is our ability to respond to any enemy threat.

To be sure this ability does exist, it must be tested. The past couple of years have been the era of readiness training in the United States Air Force. But training alone does not give the total picture of our ability to answer enemy aggression. War plans must be tested; support capabilities must be evaluated; tactics must be employed and evaluated. All this must be accomplished in light of the true enemy threat and their ability to exercise their military strengths.

This is the basic charter of Project Checkmate. In essence, Checkmate is an Air Force Chief of Staff created and endorsed activity which reflects his emphasis on across-the-board readiness. The Air Staff today is vertical in nature. Five Deputy Chiefs of Staff organizations and the Comptroller answer directly to the Chief of Staff as do 12 staff functions. The Chief believes that readiness issues must be addressed horizontally, incorporating the functional expertise of the vertically structured DCS's into maintaining an effective, coordinated fighting force. To evaluate our successes and failures in achieving this goal is one of the major objectives of Project Checkmate.

Before going into the nuts and bolts of how they do this, let's set the stage with some background on how this project originated and developed. In November 1976, General Jones voiced a need to establish a unit to evaluate across-the-board readiness to execute wartime operations. Although readiness had long been a concern of the Air Force command structure, problems remained and possible solutions were slow in surfacing through the Air Staff process. Someone needed to take a big picture look at the integration of DCS responsibilities to identify exactly where the hang-ups were and to propose solutions. Major General Hoyt S. Vandenberg, Jr., Director of Operations and Readiness, took the initiative to form the group envisioned by eral Jones.

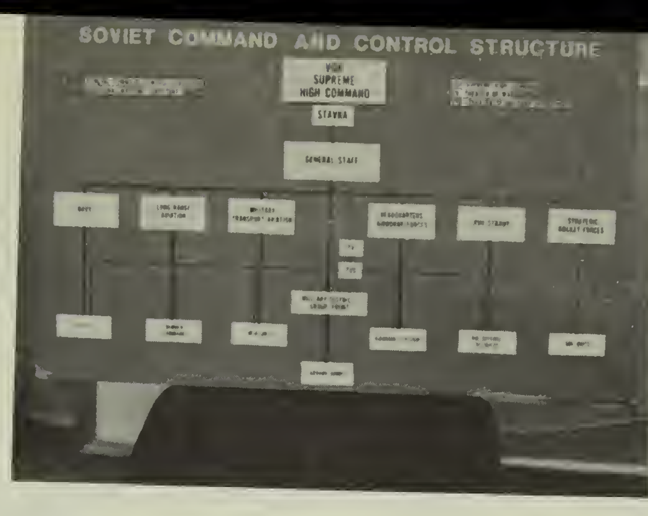
Project Checkmate, appropriately named by B dier General Louis C. Buckman, Deputy Directo Combat Readiness, was begun with a core of Air action officers. It was placed under the Plans Operations DCS (XO) but was not considered a mal Air Staff function. Its special status all Checkmate to avoid roadblocks sometimes inh within norm'l Air Staff coordination procedures provided Checkmate with a direct communication to the Chief through the XO chain.

Its original charter was to identify those fa which will tip the scales in the United States' fav a conventional conflict concentrating on a Euro NATO scenario. The checkmate organization formed by drawing upon personnel from acros functional DCS staffs with only the brightest and successful action officers identified for the initial c It was supplemented by experts from many fe agencies on an as-needed basis. The regular staff bered 14, with as many as 20 augmentors used given time.

The setting was one of a think-tank approach. staff would not be constrained as to what they look at and what they could say. They were free t into any aspect of war plans and force responsive In their own words they "concentrated on the n approach with many, many snapshots into the mi Checkmate was privy to intelligence information all sources.

One of the most unique aspects of Checkma their extensive reliance on operationally oriented cers to evaluate and apply intelligence informatio Soviet capability. These operators know the prob that the Soviets may have because they unders how operational problems affect our capability analyzing capability versus operational deficiencie now have our best picture ever of how strong th viet military is and how far its arm can extend.

Project Checkmate was divided into two grou the Red Team and the Blue Team. The first months after inception were spent in total acad



The Red Team devoured every open source round reference on Russia that they could lay hands on. The idea was to get them thinking in viet mentality. They studied the history, econom- olitics, and social structure of the U.S.S.R. The was to lay the groudwork for a glimpse at So- rengths and weaknesses from a Russian point of rather than an American perspective. In other avoid a mirror image.

er this education process was complete and the elt confident that they possessed a good feel for mentality and aspirations, closed source litera- ame next. Armed with the necessary security ice, the Red Team members began the arduous f establishing contacts and confidences within telligence community. These sources revealed information that now had to be sorted, aligned, alyzed. Formerly established capabilities were uated from the operator's viewpoint. The So- bility to integrate their forces and logistics sup- as studied, just as the Blue Team was doing the ing with NATO forces.

Blue Team was doing a good deal of studying ves. Functional expertise can often lead to tun- ion; and that is exactly what they wanted to Each man was tasked with finding out as much ould on what each DCS and SOA was doing in perating area of concern. They also became it experts on US Army and US Navy opera- oals, and effectiveness. Informal assistance was and contacts were made with Army and Navy onal personnel. NATO plans were analyzed real-time look at the ability to carry out those Military forces were tabulated and indexed down vidual aircraft. Materiel levels and resupply ties were studied. The question was: "Could y do what our plans said we could?"

purpose for the Blue Team, and Checkmate in is not to create insurmountable evidence for more weapon systems. The goal is to deal more now" capabilities necessary to do the job with resources. They tried to analyze the use of the NATO community to see if the pieces fit.

They concentrated on force requirements, mission area analysis, doctrine, targeting, etc. The things they found wrong were, for the most part, readiness items not requiring high cost fixes. Typical problems were in use of transportation, storing of ammunition, war tactics, and an item called the friction of war. Friction of war is essentially the wartime application of Murphy's Law; the conflict and confusion of battle will encourage anything going wrong which can possibly go wrong.

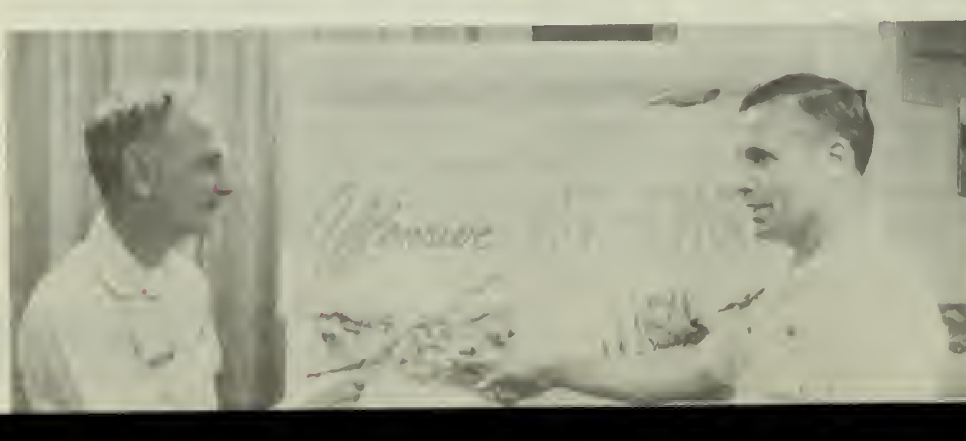
Thus, educated and ready, the Blue Team and the Red Team prepared to square off. Armed with "hand-held calculators and loud voices" the conflict was to begin. The first problem, however, was to decide how to start the war. Do we attack? Do they attack? A gradual increase in international tension or a sudden no-notice aggressive action? It soon became apparent that there was no easy way to arrive at an answer. Rather than to get involved in a doctoral thesis-type analysis of the why, they decided to limit the subject to the how.

In-depth study of the Russian mentality and the lay of the land between the Warsaw Pact and West Germany made the initial thrust points fairly obvious. The Red Team set themselves up as the Russian general staff and controlled all the military resources on the front as well as resupply capability. The Blue did the same with all NATO forces. The battle that ensued was a minute-by-minute look at what we could expect to see in such a confrontation of Warsaw Pact and NATO forces. The exercise lasted several weeks to fight a realistic conflict. Unlike other agencies which deal with war gaming and use computer modeling, Checkmate was a physical exercise of direct simulated contact.

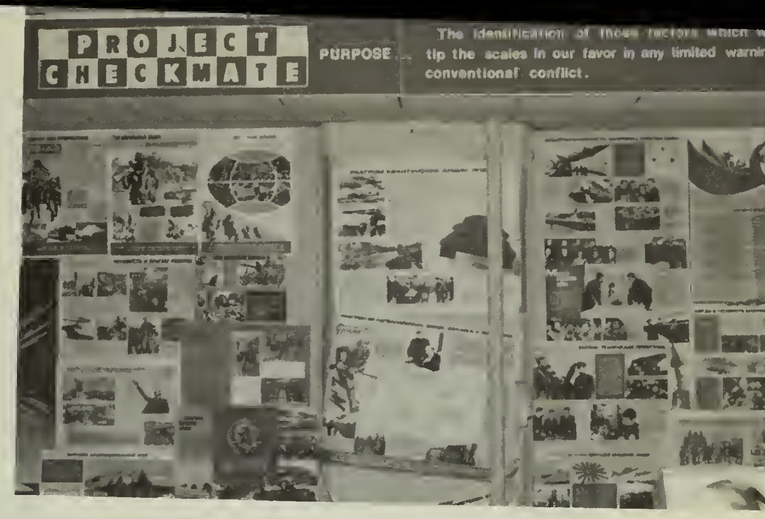
The enemy launched forces, and NATO answered the aggression. Sorties were generated and tracked on a by-aircraft basis. The limited airspace and territorial characteristics of that geographic area resulted in surprise as well as planned engagements. Kill rates and battle damage rates were determined by more than just preordained percentages; surprise attacks, aircraft altitudes, fuel state at time of engagement, ordnance on board, and experience from the Vietnam and Middle

The move/coun
approach of the
makes the name Projec
mate very appropria
team members dis
effect of the sh
enemy's offensiv

A familiar sign around the Readiness Analysis & Initiatives Group (Project Checkmate).



Above—Logistics Checkn
sonnel review NATO Q
procedures to determine
state of readiness. Left—
and Blue Team member
offensive strategy during
mate briefing to senior
A



ıst wars all entered into the formula for estimating ·borne successes or failures. Surviving aircraft were covered, wherever able, and rearmed and refueled r further missions.

The logistics people carefully tracked fuel and mutions levels. If an aircraft was recovered at a field thout munitions support, then that aircraft was out of e war until it could be fueled, flown to a destination th the proper munitions, and quick-turned for more mbat Ground losses by the NATO forces were also oked at in-depth. Enemy strengths versus our defense pability and the evaluated effectiveness of their aponry determined what logistical support was deoyed. What was left was employed based on the ysical ability (including allowing appropriate rest riods) of the load crews and support people actually igned to NATO forces.

Details of the exercise results cannot be discussed e. The benefits, however, can. As the forces and enses were employed, they revealed several probıs on both sides in the conduct of a conventional . As a result, the Checkmate personnel were able to lyze our problems, reason out alternate methods, n resubmit them into the scenario to gauge their efiveness. This was especially useful in light of the my problems identified.

ince the initial exercise, Checkmate has continued work steadily toward refinement of solutions and s to minimize problems. The staff, of course, are decision-makers. They identify problems and pose tions to the commanders who can implement the led fixes. Several important changes in strategy, ics, and equipment have surfaced since the start of ckmate. Checkmate also serves as an education m for readiness matters. The knowledge gained ng the first engagement and the many iterations e have evolved into an excellent briefing on the -of-readiness in the European theater. For 3 hours e attending are exposed to a possible NATO/War- Pact conventional war—seeing it and having the ortunity to reflect on it from a view encompassing elated functions.

This briefing is given on an as-needed basis and popular demand has driven the frequency of the presentation up to approximately twice a week. The list of dignitaries who have attended is truly impressive, and the audiences are an interesting composite of people from all levels and branches of government.

Readiness is a high-interest item with Congressional and House staffers. Several Senators and Representatives have also taken time from their busy schedules to see what the Air Force has to say. The Secretary of Defense and Secretary of the Air Force and many on his staff have attended, as have representatives of several other federal agencies. The Army and Navy have been well-represented by their command staff, as well as briefings to numerous NATO commanders.

Checkmate is by no means a static presentation. The studying continues. The Checkmate staff constantly meets with the intelligence community and functional experts in the Air Staff and other services. As more new things are learned, the briefing is updated and more recommendations are made.

Perhaps the biggest reason for the success of this project is the high motivation of the participating personnel. The assignment has changed the life styles of the people involved. Their outside reading is now geared toward works on Soviet life and military tactics. People give up leave and off-duty time to attend scheduled briefings. Each man has been able to learn enough about the other guy's area to be considered an expert. Air Staff problem solvers seek out Checkmate's advice because of their knowledge and skill in looking at problems across the vertical organization. The education they have received has got to be equivalent to a postgraduate degree in international relations and military strategies. As one man put it: "I'm totally pleased and amazed that I'm being paid for this excellent opportunity to learn."

Aerospace Safety *magazine wishes to thank Colonel E. F. Martin, Chief of Project Checkmate, Lt Col W. R. Topp, Blue Team Chief, Lt Col J. A. Norden, Red Team Chief, and all the personnel of the Project Checkmate team for their cooperation and assistance during the research for this article.* ★

MAYDAY, MAYDA[Y]
I'm Going To Ditch

CAPTAIN GEORGE R. JACKSON
43d Strategic Wing

The following is a true story of a ditching incident off the coast of Saipan as told by Captain Ray Starling (Andersen AB Legal Officer) to Captain George Jackson (Andersen Flying Safety Officer). Th[e] incident began at 0545, Saturday morning, 11 March 1978.

After completing normal morning activity, Captain Starling looked out on another beauti-
ıl morning on sunny Guam. A ear day with little wind, it was erfect for his first cross-country olo in the Aero Club Cessna 150. fter breakfast, he was off to the aval Air Station Aero Club to eet his instructor.

Major Art Lund arrived at 0705 open the club office. He is a dar navigator assigned to the omb Nav Branch at Andersen, d, on weekends, is an Aero Club structor. This Saturday he was lping Captain Starling plan and ordinate a solo cross-country m Andersen AFB to Rota, pan.

Everything was quite normal ough pre-flight. All instruments ked good and all survival items e in place. At 0805 Captain rling got clearance for takeoff. utes later he was level at 5,500 r the water. There were very clouds and visibility was unted; it just couldn't be better—ould it?

Halfway between Guam and an, over open ocean, with no rgency fields nearby, the engine suddenly decreased to idle. tain Starling tried to adjust the ttle, but the rpm would not inse. Next, his emergency training ed to take control. He pered the steps his instructor had ht him for just such an emery. First, fly the airplane (sound iar?). Next, trim and airspeed is beginning to sound like r Ware's briefing from the fied Flight Instructor Course -52 IPs). With the airplane r control, Captain Starling his Mayday transmission.

am Approach responded to the nd monitored the aircraft po- while Captain Starling con- l his futile attempts to increase e power. After several runs through the checklist and a conversation with Captain Milchanowski, another Aero Club IP, Captain Starling told approach that he couldn't make Saipan. He was going to ditch.

When he realized he couldn't glide to a land base, he began to review ditching procedures. He checked his personal equipment, and everything was in place. The life vest was securely fastened and the raft was within arm's reach. Restraining devices were tight, and Captain Starling was ready for the final phase.

He turned the aircraft into the wind and waited. Initial water impact was not severe. He had taken worse falls while water skiing. As the tail hit, the nose dove into the water at a 60° angle. The next sensation was water in the cockpit. He removed restraining devices and opened the aircraft door.

As he exited, he shoved the life raft out the door. Once he was in the water, the waves pushed him against the airplane. This caused some problems. He was forced under the water as the wing came down near his head. Finally, he got clear of the airplane and found the life raft, but another problem developed.

The sea anchor on the raft was entangled in the airplane. As the airplane sunk, so did the life raft. Frantically, he pulled and gnawed at the ropes (sure could have used a knife about then). Finally, the ropes came loose, and the raft was free. He crawled in the raft and waited for rescue.

At 0920 the rescue chopper arrived, and out jumped a frogman with a buck knife in his teeth (you guys are here to rescue me, aren't you?). Captain Starling told the frogman he could swim, and he wasn't hurt. Then came the shocker. The frogman punctured the life vest and the raft. This action prevented either item from being sucked into the helicopter's rotors; however, the action didn't do a thing for Captain Starling's confidence. As he floundered in the water waiting for the chopper and its horse collar, Captain Starling drank a gallon or two of ocean. Finally, the collar was secured around the victim and Captain Starling was pulled to the safety of the helicopter.

The rest of the story is a happy ending. Wife, instructor, and FAA official were all relieved to see Captain Starling when he got back to the Naval Air Station, but the story isn't quite over. There are certainly some lessons to remember (none of them are new).

First, Captain Starling used all the flying ability he had, to think and analyze the situation. Remember the poster with a Cessna 150 and MAC 141 which reads: "Both Require Proficiency and Judgement"? Well, it's certainly true. Ditching a fixed gear airplane is no good deal, but training and proficiency really paid off.

Second, don't assume the aircraft is useless when initial impact occurs. You have survival equipment, but you must know where it is and how to use it.

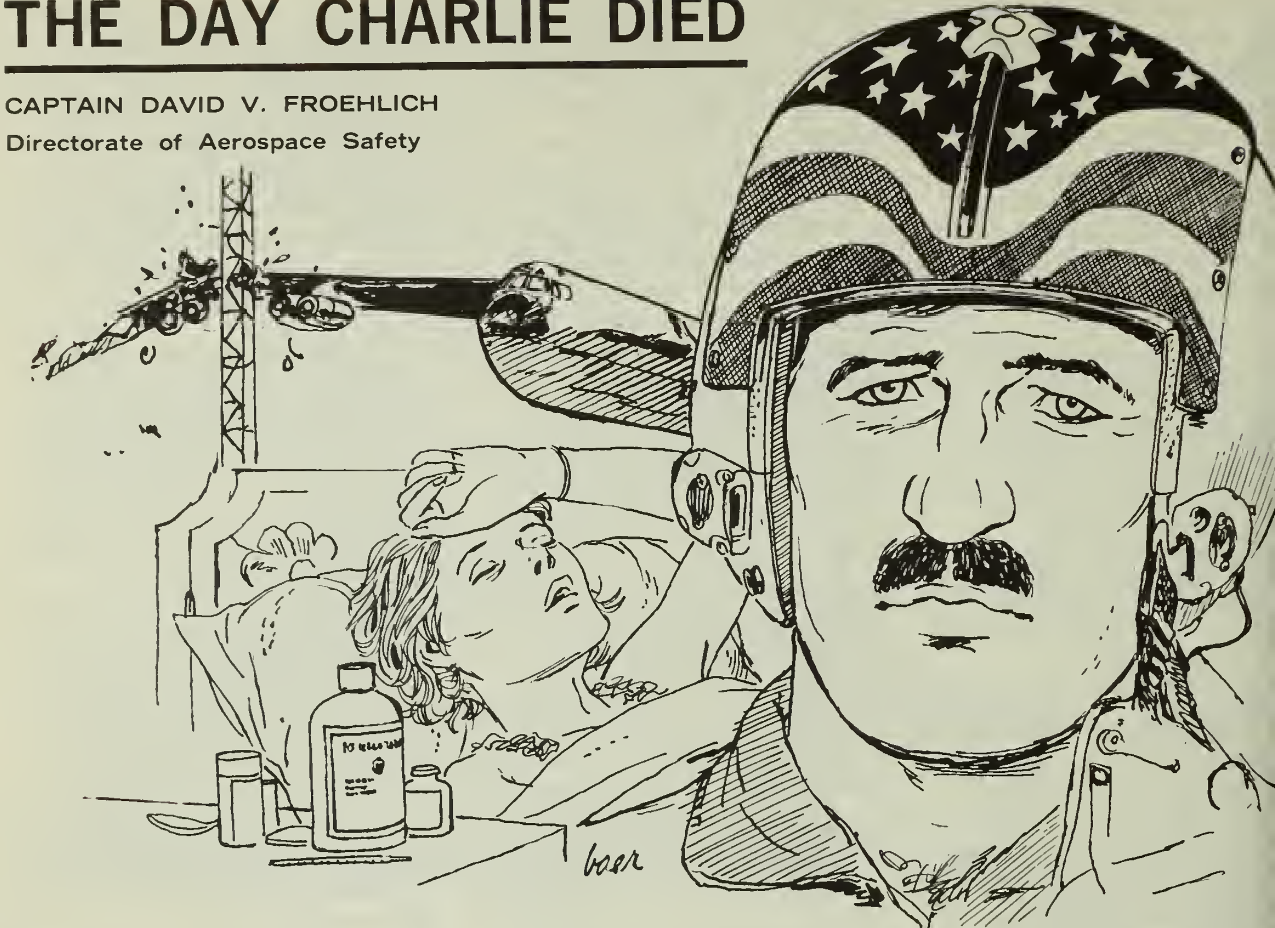
Finally, the rescue is not complete just because SAR arrives. All your land and sea survival training is worthless if you don't do your part to help the rescuers. ★

ABOUT THE AUTHOR

Captain Starling had less than 100 flying hours at the time of the accident. Captain Jackson is the Andersen Flying Safety Officer and a B-52 Instructor Pilot with 2,400 flying hours. Both learned much from this experience. We hope you have also.

THE DAY CHARLIE DIED

CAPTAIN DAVID V. FROEHLICH
Directorate of Aerospace Safety



Author's Note: Charlie is a fictitious flyer. He is the guy who sat in the left seat, flew on my wing "up North," yelled at me from the back seat or hovered over me while I was pulled up on a cable. Charlie is the aviator with the mental and physical ability, and skill, but through some disregard of rules, limits or flight discipline, he kills himself (and mayhaps others). Those of us who fly, either have known or will know, a Charlie, before he kills himself.

Charlie felt like the most senior captain in the Air Force. He missed the last O-4 board by 2 days and then the "power" decided to delay the next board "in order to . . . (mumble, mumble, mumble)." When it comes to pilots, Charlie's a pro. He left UPT and traded in his white rocket for an eight-engine aluminum overcast at Castle. He found his niche, however, and became a "good" copilot. A "good" B-52 copilot would usually be a "great" copilot in the right seat of any multi-place machine that also carries a loadmaster, flight engineer, steward or the other folks that do all the same stuff a *Buff* deputy does.

Minimum time and several *arclight* tours later, Charlie upgraded to the left seat and got his first crew. Shortly thereafter, he put in a 1-year tour as a "NAIL" and came straight back to the land of snow and ice and Buffs.

Everything in his first 11 years had been normal progression. Smooth until last year as a matter-of-fact. Then things began to sour. The Mrs. had taken ill.

At first, she was just sick enough to be miserable most of the time. The docs at the local USAF facility had thrown their hands up and not been able to volunteer a diagr
Charlie had taken leave to tak
to a "specialist." No luck ther
either! So now Charlie didn't
anymore than he did at the be
ginning. That was the most se
problem, but all the little grem
seemed to be cropping up at c

The mission planning had
done on alert. It seemed like a
idea and had been done for y
that way. Charlie, however, a
had a nagging feeling that he
didn't have quite the handle o
upcoming 10-hour flight that
when the planning and briefin
were done the day before. Le
might as well start sorting thr
the mountain of paper in the
sion folder. Flight orders—b
crew with two captains, three
tenants and a tech. I rememb
days with nothing but majors
L/C's on crews.

The mission—we drew a g

one. Heavyweight T/O, fighters unning intercepts, high runs, re- ueling, low level with racetracks nd back home for a few approach- s. Not missing much! Weather? Great, as usual! Multi-layered rrus for the fighters, high runs and efueling; low crud with thunder- orms and possible turbulence for e Oil Burner. That's just what I eed! What? Phone call. "Uh—OK, there in a minute."

Charlie's mind was not running the 100 percent mission concen- ation level. The phone call was om his wife letting him know of other small domestic problem. rmally, no biggee! But today, it s just enough to send his mental mputer and patience bank into erload. He returned to his pre- ssion briefing. His attention ndered; he snapped at the nav the EW during the briefing and his checklist in the mission efing room when the mob got on bus. Definitely didn't have his together.

Pre-flight was OK and they went k outside for a stretch before ne start. Charlie knew it wasn't day when the stanboard het man arrived with seventeen pened pencils and announced t thought I'd ride along and your 'co' a no-notice."

akeoff was normal—as normal 10,200 foot takeoff roll can The half million pound machine ered toward flight level, and our and a half later they were arget for jocks out of a nearby mover base. Intercepts and runs went OK, but Charlie tell that his "suite-mate" was us.

remembered the feeling. As guy, he had worked hard at b as a copilot, but it always d that whenever an evaluator ed on board "the harder he the behinder he got." Some oard folks (the minority, unfortunately) were better than others. Some had the knack of putting you at ease, letting you do your job and yet giving you an evaluation that really helped you improve as a crew member. This guy wasn't like that!

Charlie found the tanker in the thin soup. "Stabilized—pre-contact—ready." "Damn!" Charlie silently cursed the bureaucrats for his lack of proficiency as he slid out of position. You can't be good at this when you only get to do it once every 2 or 3 weeks. You're also supposed to help the "co" learn how to refuel, too. Fat chance!

Charlie was working hard! In and out of the clouds, he hung on, got the gas and then relaxed and got two more contacts. He hung on extra long the last time and didn't even offer the right seater a practice shot. When the final disconnect came, he saw the copilot look at him with "Thanks, I didn't need that" in his eyes. They had an hour before low level entry and Charlie needed a stretch. He had just realized how really tired he was already and there were still 5 hours to go.

Charlie harassed everybody on the way downstairs and back up again. A good-natured harassment about job, leave, and miscellaneous. Harmless, except on the way back up, Charlie began to think about wife, family, and problems.

Concentration broken! Strap back in—everything OK? Get ready for low level entry. Weather? Yuk! Just bad enough to make life miserable, but not bad enough to cancel. Checklists accomplished. "Boy, she really sounded bad when I talked to her before takeoff. I sure am tired; what, oh yeah, leaving FL 240 for 160 enter OB- . . . ."

Through the low level (flown at IFR altitudes because of weather) everything went OK, and the first bomb run seemed good. On the second racetrack, Charlie's concentration began to wander, his tiredness showed in heading and altitude control. He snapped at someone on the intercom and missed a radio call.

Turning inbound to the IP. What's that light! Hydraulics! Co—take the airplane, I'm gonna check out the hydraulic problem! What? A generator out! What radar? Yeah, I know the heading, I'll roll back in a minute . . . .

Charlie was a competent pilot. That day he had no business in an airplane. On a VFR day with no problems and no additional factors (stanboard/emergencies, etc.), he probably could have handled everything, but this day he couldn't. The mission was complex, the weather was bad, the machine began to come apart and worst of all, he was tired and had too much on his mind. At the critical moment, his mental and reaction computer overloaded and he stopped flying the airplane just long enough to overshoot heading, lose 600′ and collide with an 1867 foot tower. The IP and copilot were intent on the electrical panel; the RN and nav were setting up for the next run. Nobody noticed until it was too late. Charlie could have handled it all if he just had his stuff together and his head on straight.

Mental overload killed Charlie and he took six others with him. No causative aircraft malfunction will show up in the investigation; the aircrew qualifications and experience will indicate no reason for the mishap; the 72-hour histories won't give any major clues; crew rest was "not" a factor! The mass of twisted metal will not answer any question. CAUSE: UNDETERMINED. That was the second day Charlie died. ★

OPS TOPICS

LOOK OUT

A recent survey showed that more air misses occurred at lunchtime tha any other time of the day or night. Now, many theories have been put fo ward as to why this should be so, but the one I go for is too many peop with their eyes on their lunch and not outside the aircraft. Be warned. Lool ing out is your last, and most effective, line of defense. The statisticiar have now proved that you need your eyes most at lunchtime. (RAF Fligl Safety)

STEER CLEAR

Hail yes! Recently a heavy was exiting an IFR low-level route structu heading for the "high exit point." At approximately 18,000 feet in clear ai the crew encountered what felt and sounded like rain. Nearest heavy clou (on radar) were 17 and 22 miles away respectively. Over $3,000 worth hail damage resulted from phantom hailstones estimated to have been ca ried over 20 NM by high winds aloft.

EMERGENCY DECLARED

A fast-mover was in the pattern of a round-robin base shooting GCA's. Aft the last low approach, the crew received clearance to return to the hon drome. During the next few minutes, due to frequency switchover problen and an emergency in the aircraft, things went sour. Happy ending—cre safely landed at the round-robin base, but their declared emergency nev made it. The emergency slipped thru the crack and had they needed the fi and ambulance folks, there was nobody waiting. Moral—Make sure th everyone gets the word when you've got a sick bird and are limping hom

LANDING OPTIONS

When a landing is not going just right, the pilot has to make a decision to (1 make any necessary correction, or (2) take it around. The latter action often the wisest move but one of the hardest for a pilot to make, regardle of his experience level. Recently an aero club pilot was distracted durir base turn and forgot to lower the flaps. Consequently, he landed fast ar probably three-point or nose wheel first and got into a porpoise. With mo experience, he should have been able to salvage the situation by either e tablishing a proper landing attitude and adding sufficient power, or by aba doning the landing and going around. He did neither and the aircraft end up gear in the air. There have been several landing accidents in commerci aviation in the past couple of years which stimulated a number of articl on the landing vs go-around decision. Almost all flights end with a sa landing and pilots develop a mental set that tells them they are going land—not go around. Instructors would be providing their students a re service by developing a clear understanding of the options during landi and that going around when in doubt is the mark of a wise pilot.

EYES OPEN!

The B-52 had turned inbound from the racetrack prior to the radar na gators TIP. The pilot observed a light aircraft at about one and one-h miles. The light aircraft appeared to be at the same altitude of the B-5 9000 MSL. The B-52 began a climb and crossed directly over the light a craft at an estimated 400 to 500 feet. The light aircraft was observed have taken no evasive action. Good job! Don't let bomb runs or IFR al tudes keep you from seein' and avoidin'.

OPS TOPICS

WX ALERTS

In May new SIGMET procedures were introduced, but probably not everybody knows about this. A convective SIGMET which implies severe or extreme turbulence, severe icing, and/or low-level wind shear will be issued, when required, on both a scheduled basis each hour at 55 minutes past the hour and on an unscheduled basis as a special report. These SIGMET alerts are valid for a one-hour period and will be distributed nationwide by FAA/NWS. Part A of the convective SIGMET, which is a brief description of the thunderstorm area in terms of NAVAID locations, will be relayed directly to inflight aircrews by the controllers rather than by telling the airborne crews to monitor a VOR broadcast.

NEAR MIDAIR

A Recce type, in his RF-4C, was flying along an IR in VFR conditions when he had a near midair with a light aircraft. During the investigation, it was discovered that the IR passed close to an uncontrolled airport that was not on the TPC (Tactical Pilotage Chart—scale 1:500,000′) that the crew was using. It did, however, appear on the Sectional with the same scale. Are the airports that could affect the military training route that you're flying depicted on the chart that you are using? It sure would be nice to know where to look for possible traffic.—Maj Joseph R. Yadouga, Directorate of Aerospace Safety.

STRUCK BY LIGHTNING

On climb-out while in a heavy rainshower at 15,000 MSL, an HC-130N crew saw a flash of lightning coming from their 12 o'clock position and felt a slight vibration on the floorboards of the aircraft. After the static discharge was noted, the crew checked radio, radar, and navigation equipment and found it to be operating correctly. Upon arrival at their destination, the aircraft was visually inspected for damage. The radome had pinholes. At no time during the flight did airborne or ground radar indicate that the aircraft was within 10 NM of thunderstorm cells. Aircraft was returned to home station where radome was removed and sent to depot for repair. (Lightning will getcha!)

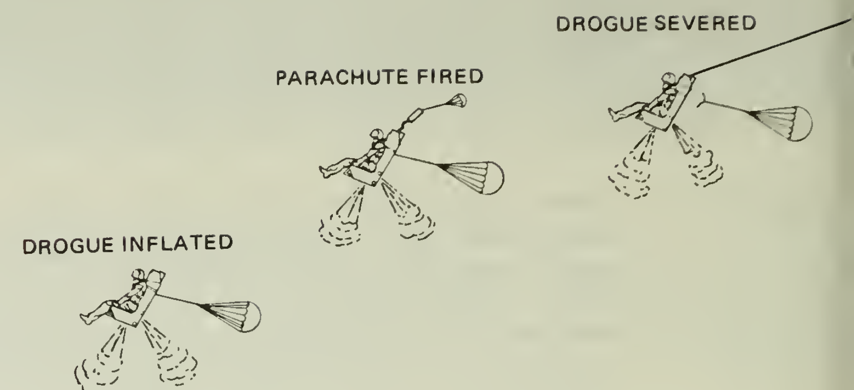
MIN POWER ON GROUND!

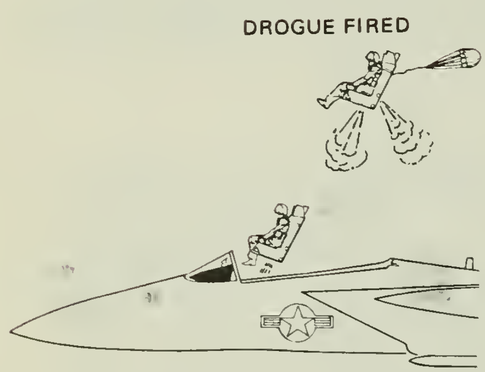
A C-5 blew over some ground equipment while recovering at an overseas destination. Some distance and equipment problems were related, but this serves as a good reminder to watch that heavy throttle hand coming out of the chocks, arming areas or anywhere for that matter. Minimum taxi power is the watchword!

TAXI CRUNCH

They do it too! Extracted from a major air carrier's safety bulletin is the following:

"Taxiing onto gate, the aircraft struck an improperly positioned maintenance tractor. Because of other improperly positioned equipment, the mechanic's attention was diverted due to a clearance problem between a cargo loader and the left wing tip." What a waste! Check your ramps and hangars for obstacles one more time. ★





ACES I

MR. RUDOLPH C. DEL
Directorate of Aerospace

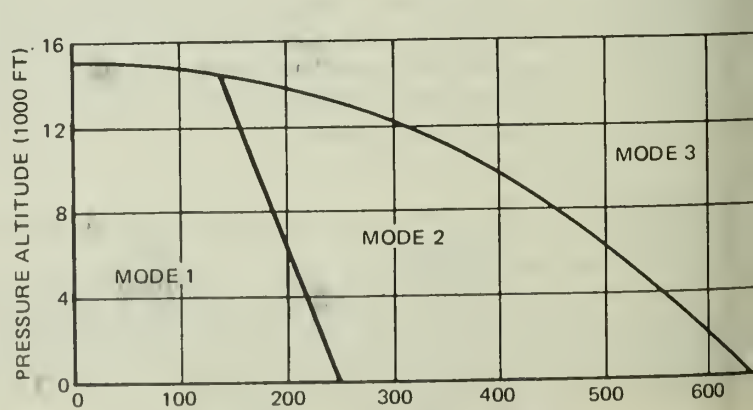
The Air Force's newest and best ejection seat, ACES II, is now operational. This article addresses some of its good points and discusses some of the features which have caused some misconceptions about it. It also provides some of its history. More detailed technical information should start to become available through the Life Support and Safety organizations of the units getting these seats.

ACES II, the advance concept ejection seat, is here. At times an elusive dream to those of us in the emergency escape business, it has at long last become a reality.

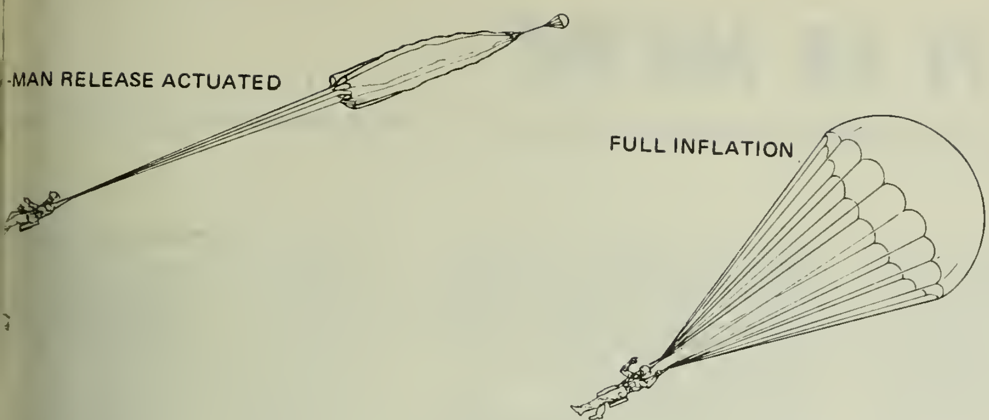
It had been in the making for over 11 years and there were times when it appeared as if it would never get here. But, it is indeed here now. Production A-10 aircraft number 102, delivered to the Air Force in April 1978, and production F-15 number 273, delivered in May 1978, were equipped with the ACES II. The F-16 was to have ACES II as the aircraft started coming off the production line in August 1978. A-10's and F-15's equipped with the interim ESCAPAC seats will be retrofitted with the ACES II starting in the fall of 1979 for the A-10 and the spring of 1979 for the F-15.

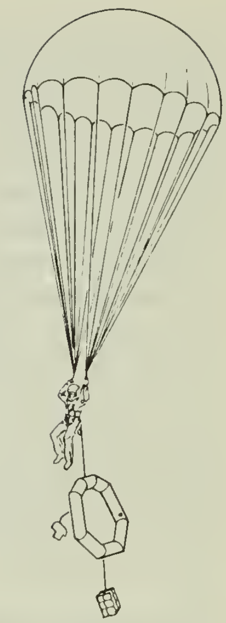
ACES II, called a high performance escape system, was developed by the Douglas Aircraft Company under contract to the United States Air Force. This increased performance capability enhances the survivability of aircrews du cape from aircraft under conditions, throughout a la centage of the aircraft's fl velope. The seat is conside ged, lightweight and easy t tain. A sampling of its a technology subsystems inclu

- Three operating modes vide optimum performance complete 0 to 600 knots eq airspeed escape envelope.
- It uses a seat-installed system for recovery mode s



MODE ENVELOPES





S HERE

uses an electronic sequencer
redundant circuitry to provide
um sequencing and timing for
mode.

uses a gyro-controlled vernier
to stabilize the seat/man
nation in pitch at low speeds.
ses a hemisflow drogue para-
to stabilize and decelerate
at/man combination at high
.

personnel parachute is de-
by a mortar for consistent
operation.

• It has personnel parachute canopy reefing capability to permit high speed deployment without excessive onset of forces on the crewman.

• It has a single-point emergency ground egress release control.

All of the foregoing combine to make ACES II the best ejection seat the Air Force has ever had. In fact, if this seat works as advertised, it has the potential for actually improving the ejection survival rate by saving some of the crewmen who eject near the outer edge of the envelope in present systems. This, though, is provided that crewmen do not "compensate" for the ACES II's improved capability and decide that with this seat they have more time to recover a sick or departed aircraft. If this is the case, then this very large investment in safety will have been made in vain.

The stability engineered into this seat should also help reduce some of the flail injuries that unstable seats are capable of producing.

Another thing worth mentioning about ACES II is that its performance exceeds that of the military specification it was built to. This ranges from 29% in the minimum ejection altitude requirement for inverted attitude ejection at 150 KEAS (200 feet required versus 143 feet actual) to 350% for the 10,000 feet per minute sink at 150 knots level attitude capability (300 feet required versus 85 feet actual).

The ACES II rocket catapult is rated at 14 G's peak acceleration

AIRCRAFT ATTITUDE	VELOCITY (KNOTS)	ALTITUDE REQUIRED (FEET)	
		MIL-S-9479B	ACES II
G PITCH, 60 DEG ROLL	120	0	0
G PITCH, 180 DEG ROLL	150	200	143
G PITCH, 0 DEG ROLL)0 FPM SINK RATE	150	300	85
DEG PITCH, 0 DEG ROLL	200	500	286
DEG PITCH, 0 DEG ROLL	450	500	401
DEG PITCH, 60 DEG ROLL	200	550	312
DEG PITCH, 180 DEG ROLL	250	600	385

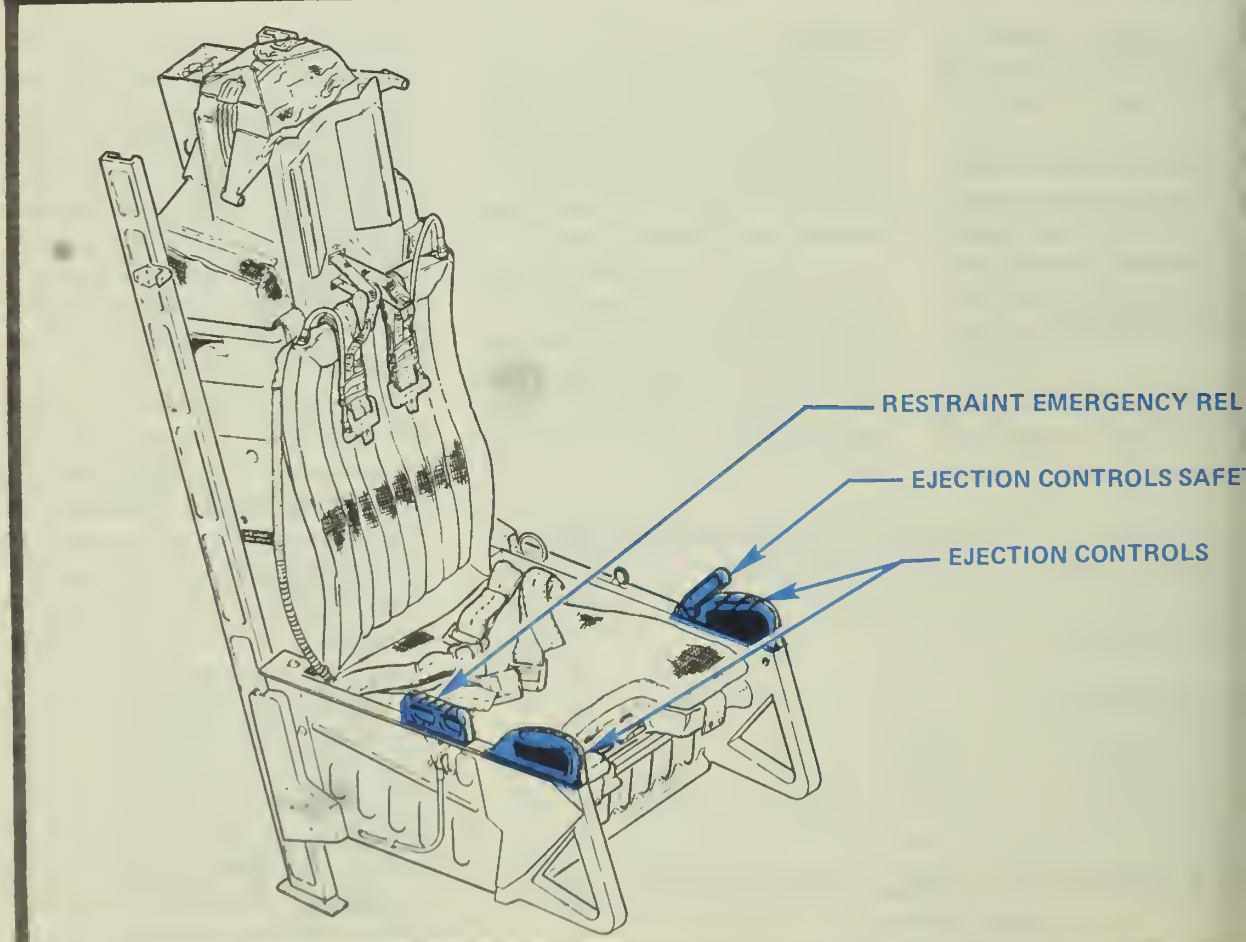
ACES II PERFORMANCE

ACES II IS HERE continued

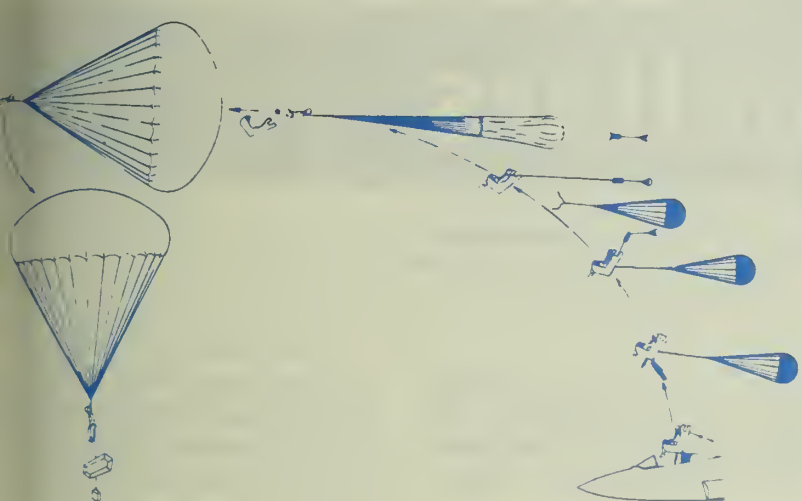
with a nominal impulse of 1150 pounds-seconds. Average seat velocity at the end of the catapult stroke is 43 feet per second. This rocket has a lower impulse than some of our existing seats have. This should help reduce the vertebra compression fracture rate attributed to seat acceleration during ejection in present systems. This lower impulse is made possible by the entire system's rapidly programmed total operating time. This varies, depending on ejection conditions, from approximately 2 seconds for mode 1 (low speed, low altitude) to up to 6 seconds for mode 3 (high speed, high altitude). These times do not include canopy removal or seat sequencing (two-seat aircraft) timing.

Some of the controversial characteristics of the ACES II involve the fact that it does not provide "bailout" or over-the-side capability. That's right. You can only abandon the airborne aircraft by way of the seat. Lest you think the Air Force was crazy for buying such a seat, read on. The last successful bailout from a fighter type aircraft due to a seat malfunction occurred in May 1968. That means one bai of 2071 ejections over a period. So it would appear odds of ever needing this c are pretty remote.

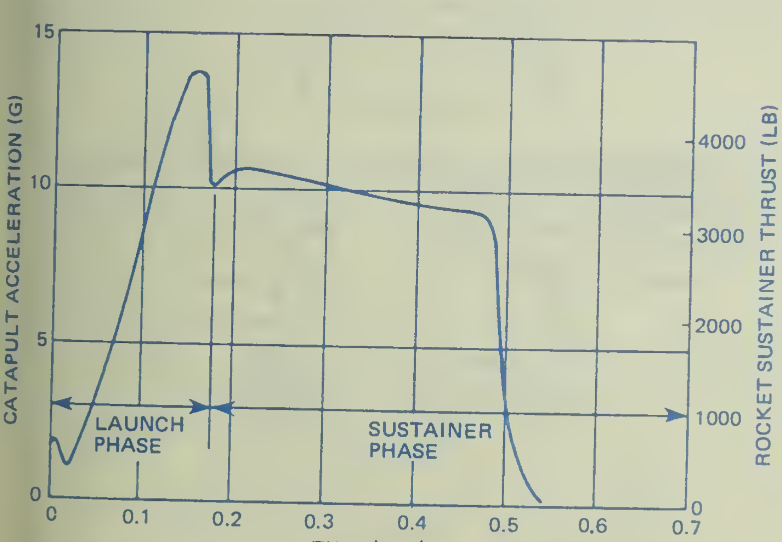
Another one of the cont has to do with the fact th was built primarily as a ejection initiated seat. Tl and F-15 seats will be side tiated. The F-16 seat will b initiated because the side tiation controls would ha faced with the aircraft's controller and the throttle you D-ring jocks mutiny, l



hat injury data, laboratory/centrifuge testing, timing tests, and pull force tests all favor the side-arm seat over the D-ring. Besides, you can't get both full hands on a D-ring like you can on side-arms. This will better protect you against arm flailing.



MODE 2 OPERATION

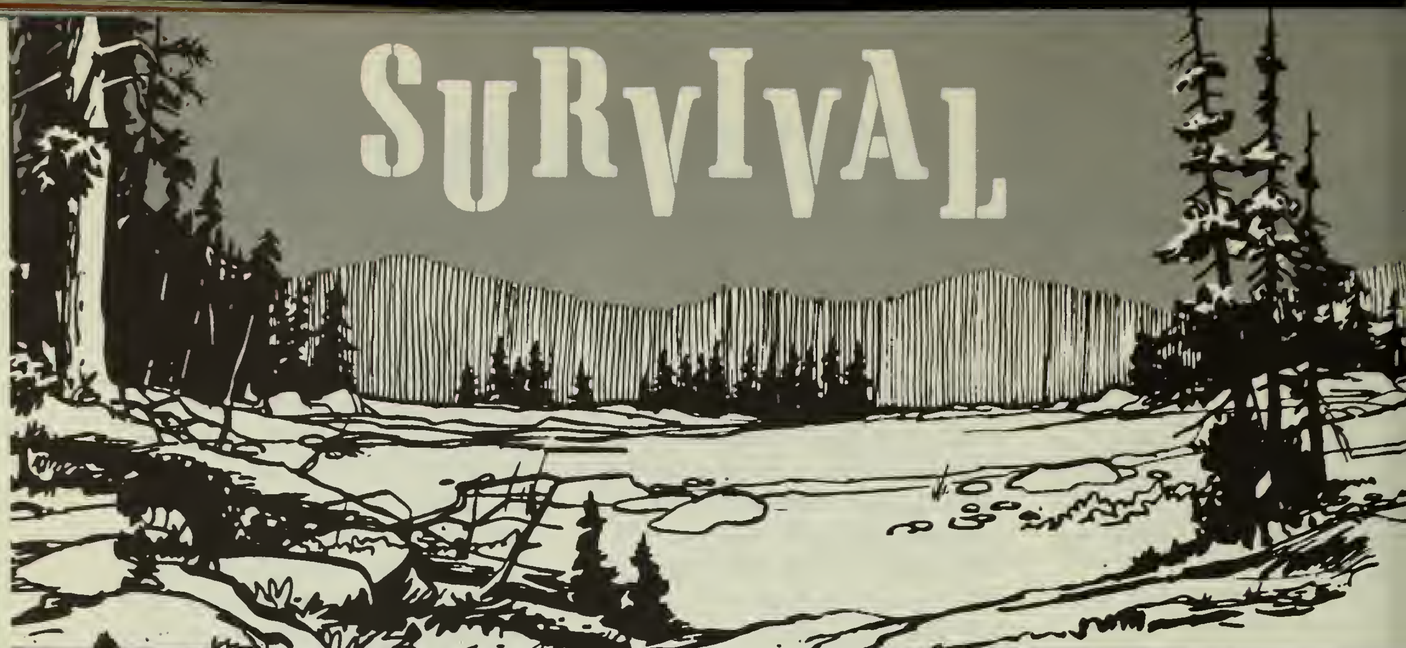


TYPICAL ROCKET CATAPULT ACCELERATION AND ROCKET MOTOR THRUST VERSUS TIME CURVE

The idea for ACES II started out many years ago when somebody decided that the Air Force ought to have a standard ejection seat that could be used on all newly developed aircraft. Heretofore, aircraft manufacturers had more or less a free hand on what seat they could put in their aircraft. In many cases, this meant using whatever was available and would fit. There were specifications but they apparently allowed a lot of leeway as to the seat used. Evidence of this can be seen in our older aircraft which have a proliferation of many types of seats. Most of these worked approximately the same but yet, they were quite different from each other.

It was then decided the Air Force would develop a standard ejection seat encompassing the latest state-of-the-art in escape systems technology, which could be provided as government-furnished equipment (GFE) to manufacturers developing new aircraft. This task was assigned to AFSC's ASD/ASWL, the then newly chartered Life Support Systems Program Office (LS SPO). ASD/AEL, as it is now called, prepared a new specification, MIL-S-9479A, "Seat System, Upward Ejection, Aircraft General Specification for," which was approved in 1967. They then contracted Douglas Aircraft Company, now a subsidiary of the McDonnell-Douglas Corporation, to build a prototype of the seat which eventually became known as ACES II.

In closing, we'll just pass on a bit of advice. While ACES II is capable of saving you in a variety of circumstances ranging from 0 to 50,000 feet altitude and 0 to 600 KEAS, it is still advisable, whenever possible, to slow the aircraft to a moderate speed prior to ejection. This is because while the seat may be qualified to 600 knots, your body is probably not and you can still get hurt. ★



Arctic Shelters

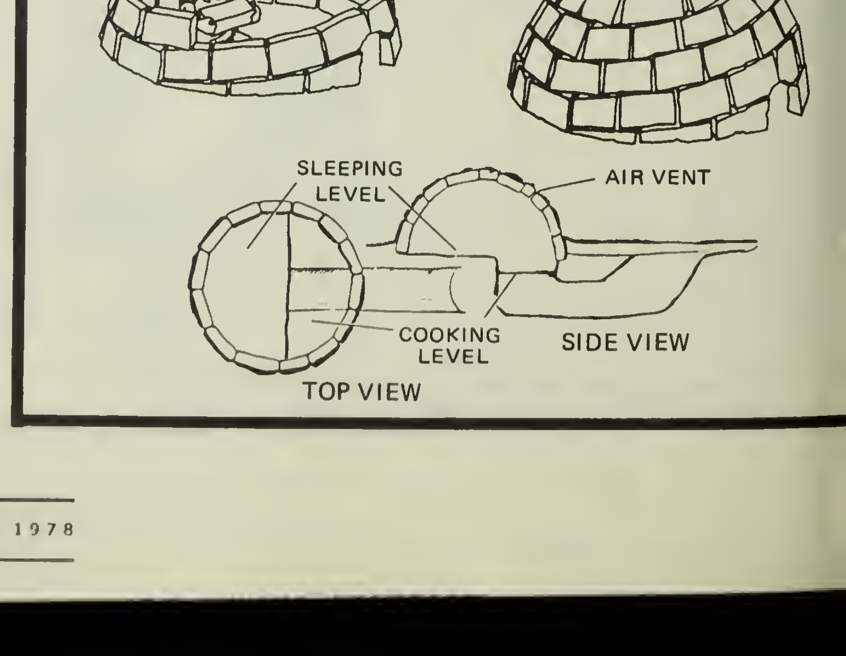
MAJOR GILBERT C. BODRAK
3636th Combat Crew Training Wing (ATC)
Fairchild AFB WA

When the temperature in the Arctic reaches −30°, and the wind gusts to 20 knots, any exposed flesh may freeze within 30 seconds. Striking? Yes, but you can survive if you know beforehand what you are going to do. The first requirement will be proper clothing and first aid, if you are injured. The next step will be shelter.

Shelter in the Arctic can be a frightening thing, particularly if all that is available is snow. Generally, in North America and below the tree line of the Arctic, wood is the primary building material. Above the tree line, the only material is snow.

During the winter, that dreaded blanket of snow may well be the blanket for survival. Snow possesses excellent insulating qualities. As fresh snow falls, it forms countless minute pockets of insulating air. This insulating quality can ensure a shelter that is not only warm but quiet as well. Still, snow is not considered as being very hospitable, hence some m
tal adjustment may be called
In this article, we will cons
snow shelters for use above

Drawings below show details of building a snow block house.



ree line. Granted, shelters using vood frames are equally impor- ant, but space and time preclude overing both in one article.

UITABLE SNOW

As the snow remains on the round and is blown by the wind r packed by other forces, it goes hrough a process of change nown as metamorphism. During his process, the sharp edges of he new snow disappear, and the now forms tight kernels or glob- les. This makes the snow more ense; it traps the air more effec- vely, which makes it easier to ork with when constructing such helters as a trench, snow cave r blockhouse.

NOW TRENCH

Perhaps the easiest and fastest helter to construct is the snow ench. A trench can be construct- d anywhere that sufficient hard- acked snow is found, but is nor- ally considered to be a tempor- y shelter. If, however, your stay longer than expected, it may be nlarged to a permanent one by mply adding rooms. To construct basic snow trench, mark out a ctangle approximately 3 feet by feet on the snow (these are mini- um dimensions). Cut a half- oon wedge at the base of the 3-foot wide rectangle. This will make it easier to cut and extract your subsequent blocks. Cut the blocks approximately 8 inches wide and 18 inches deep. As the blocks are cut, remove them and place them along the side of the trench. Once the blocks are re- moved from the 3 x 7 foot area, cut another trench along each side, 6 inches deep and wide. This step will serve as your base when you start stacking the blocks to form the roof.

At the end of the trench, oppo- site the entrance, start placing the blocks to form an inverted "V." Offset the first two blocks in the 6 x 6 inch trench; this will facilitate handling the remaining blocks as each is stacked against the other one at a time. Join these blocks at the top by shaving off the corners to form a flat surface and fill in any cracks with soft snow. Now, cover the ends with blocks of snow and dig an en- trance. (Shelters should be posi- tioned so their entrances are 90 degrees to the prevailing wind.)

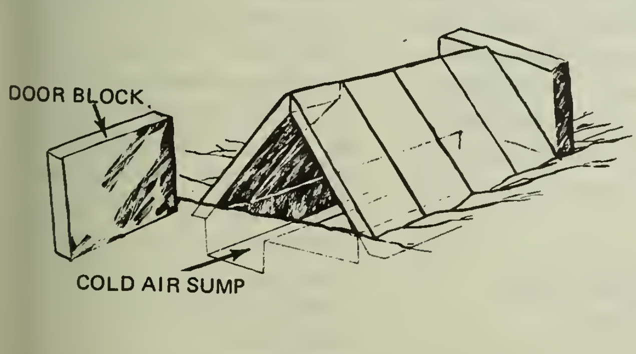
The trench has its drawbacks in that it is confining, but its design serves its purpose. For anyone in the market for more space, the recommended shelter is the snow cave.

SNOW CAVE

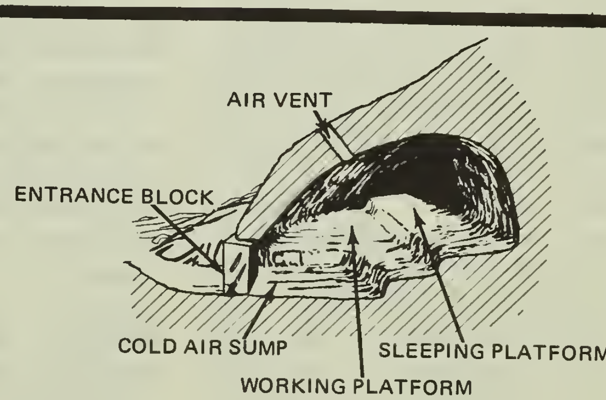
Though more effective, the snow cave requires not only more time but more snow. The ideal place to dig your cave is a large, wind- packed drift or anywhere that the snow has settled (metamor- phosed). A common method for building a snow cave is to dig a tunnel and then enlarge it to form the main part of the shelter. Here is a helpful hint from Ernest Wil- kinson in his article entitled "The Instant Cave."

Mr. Wilkinson selects snow of the slope or windblown drift and digs an entrance hole about 3 feet wide and 4 feet high. This is fol- lowed by carving out the cave without a great deal of stooping and kneeling. After removing the bulk of the snow from the cave, Mr. Wilkinson shapes the ceiling and walls into a dome placing the snow at the sides where it will be packed into sleeping benches a foot to 18 inches high. Next, a trench is dug downward toward the cave entrance.

Outside the cave, snow blocks are cut and laid forming a wall in the entrance. The wall comes up under the snow cave roof (not outside it) giving greater support to the cave. When the snow has



FIGHTER TRENCH



SNOW CAVE

hardened, a small entrance hole is cut in the bottom of the wall. By now the sleeping benches have hardened, and the cave is ready for occupancy. Is it?

With any type of snow shelter, ventilation is a must. Cut a hole (or poke it with a ski pole or handle of a shovel), preferably 45 degrees above the cooking area. If you expect snow during the night or think the vent might freeze over, leave a ski pole or shovel handle in the vent. During the night, jiggle the pole up and down effectively clearing the air passages. Secondly, poke another vent hole in the block covering the entrance to your cave. This will allow proper ventilation through your cave, alleviating stale air and the possibility of carbon monoxide poisoning.

Regardless of how cold it may get outside the snow cave, the temperature inside will be quite comfortable, and you will be protected from the wind. Ideally try to keep the inside temperature at +32 degrees or lower. This will ensure proper support for the dome and will avoid massive amounts of dripping water.

After a day-or-two of living in the cave, an icy glaze may appear on the interior surface. Scrape it off so the snow can "breathe." This will help to avoid the stale, stuffy air so common to the snow cave. Do not be alarmed after this period of time that the roof has settled. It does not mean that a cave-in is imminent. Simply shave off one or two inches of the dome to preserve your head room.

If you find that the walls are dripping excessively, it normally means that the roof is too thick. Shave some off. Conversely, if they frost over, the roof is to thin. Go outside and shovel more snow on the top of the cave.

Water is always a problem. Any outcropping of snow in the wall or dome will collect water and drip. You can avoid these outcroppings by making the walls and dome as smooth as possible. As in any phase of Arctic survival, the secret is to stay dry. Always dress for the occasion. During construction of the shelter, wear lighter garments to avoid heavy perspiration which will freeze inside your clothing, thus decreasing effective insulation. While in the shelter, dig a drain trench around the cave edge to collect the water as it drains off the dome and walls. Keep your sleeping bag covered when not in use. Should your bag or clothing become wet, store it in the entryway or on the floor away from any source of heat. Once ice has formed, it may be scraped off with a knife or beaten out with a stick.

THERMAL HEATING

During construction of the aforementioned shelters, dig the floor to ground level if at all possible. This will supply a constant source of heat from the ground. In a permafrost area, the ground temperature will average +18 degrees Fahrenheit regardless of what the temperature may be outside the shelter. Eighteen degrees then will be the minimum temperature, which will rise progressively higher as body heat or heat from candles, sterno or cook stoves is introduced.

HELPFUL HINTS FOR SHELTER LIVING

1. With either the snow trench or the cave, it is important to remember a few basic facts a[...] shelter living. Take all your eq[...] ment inside the shelter when [...] retire for the night, particu[...] your shovel. Wind and snow [...] make it necessary to dig your [...] out in the morning.

2. Once inside, organize [...] store your gear. Keep everyt[...] in its place. Shelters have [...] known to virtually "gobble [...] cups, spoons, candles, etc. [...] small items (knives, mittens, c[...] pass, etc.) to your body or cl[...] ing. Stay organized.

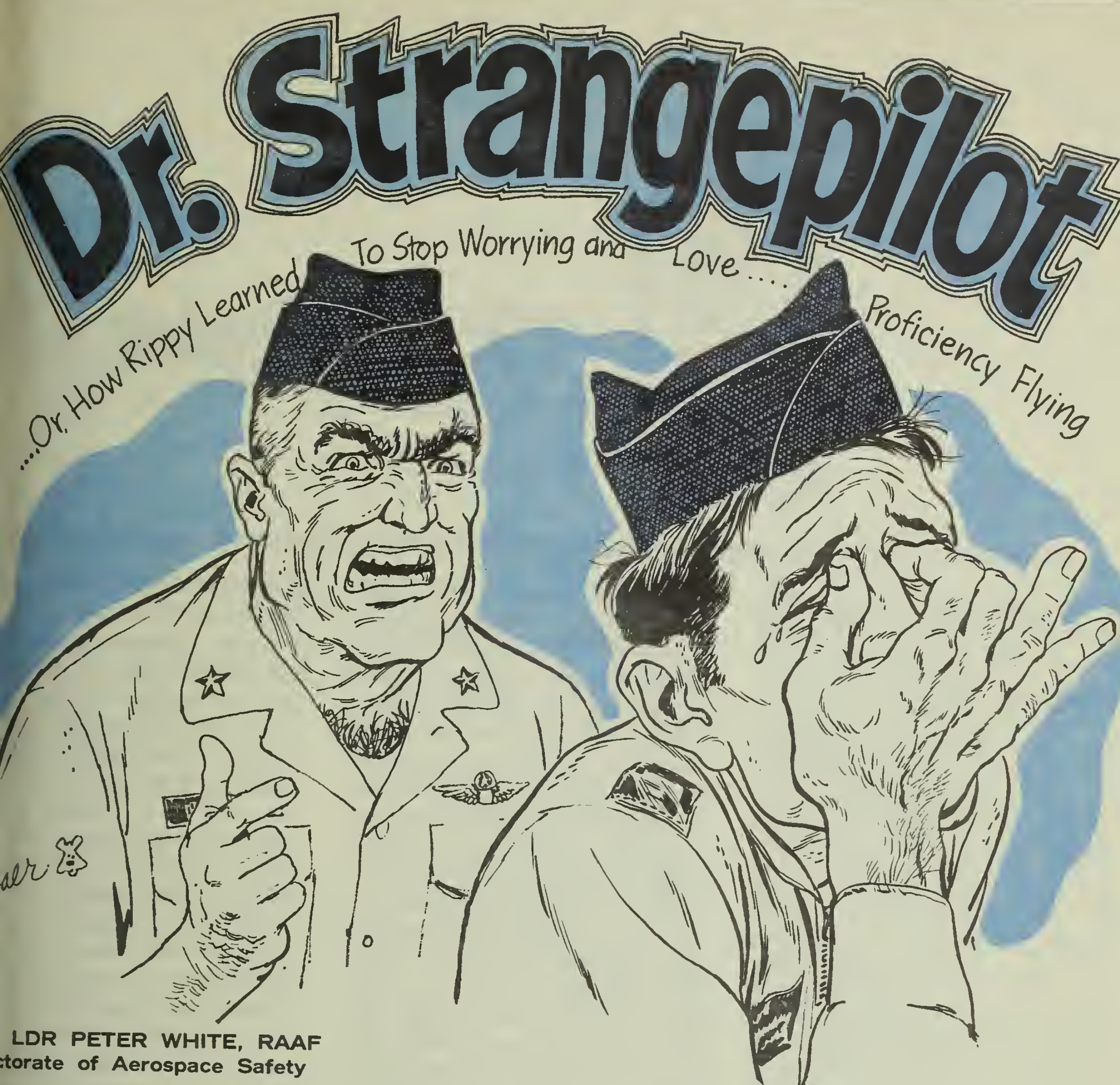
3. Never sleep directly on [...] ground or snow. Always p[...] something under your slee[...] bag (ferns, dry moss, boughs, [...] terproof pad or several layer[...] parachute material).

4. Keep your sleeping [...] clean, dry and fluffed up to gi[...] maximum loft of dead air sp[...] To dry the bag, turn it inside [...] and beat out any frost.

5. Don't let candles or st[...] cans burn through the night. T[...] are not necessary as you will [...] ceive ample heat while in y[...] sleeping bag, and they will fur[...] deplete the amount of availa[...] oxygen in the cave.

6. If you plan on any travel [...] sure the shelter is well mark[...] Parachute material on a wi[...] whip would be ideal. Snow dr[...] can all look alike in a short pe[...] of time and from a surprisin[...] short distance away.

In summary then, remem[...] that a snow shelter will pro[...] you from that temperature [...] wind that will freeze exposed s[...] in 30 seconds. With a little me[...] adjustment and prior planning [...] can and will provide you a hom[...] ample warmth. That dreaded bl[...] ket of snow can definitely be y[...] blanket for survival. ★



LDR PETER WHITE, RAAF
ctorate of Aerospace Safety

he day hadn't started at all well for Capt Rippy Proflier. He'd been dubious about ac-g the Saturday alert in the place, and the zero-dark-thirty one call from the command had merely confirmed that it rotten decision. It wouldn't been too bad if he'd just man-to hit the books the night be-the way he'd planned to, be-he boss had him work late at fice. By the time he'd arrived sunk a beer, and eaten din-e was just too pooped to drag e manuals. Still, the squadron aid that alerts were pretty lately, and he'd intended to couple of hours of review in the next day. Well, the early get up had fixed that.

The cold, gloomy 40-minute drive through the pre-dawn mist and fog hadn't contributed to his mental outlook, either. Why couldn't the general have jumped an airliner, and left him to his bed?

At Base Ops he had been confronted with, firstly, an FCIF considerably more bulky than last time he'd looked at it (was it *really* 30 days?), and secondly, Captain Nupuke, his copilot for the mission, who, it turned out, had all of 25 hours on the beast, this being only his second CP ride since checkout. As well as ploughing through the FCIF, and mastering the paperwork of flight planning, weather, command post and all the rest of the stuff, he had to hand-lead his offsider through most of the TOLD card. What did they teach these guys in conversion training nowadays? To top it all off, he'd forgotten his winterweight flight jacket, and destination was forecast cold enough to freeze the balls off a pawnshop sign.

If he'd had time to think of it, he probably could have predicted that, about that time, the telephone would ring, as it did, to announce that the general had arrived 45 minutes early, and was, quote, rarin' to go, unquote. The subsequent rush to file the plan, call fleet ser-

Dr. Stangepilot continued

vice, organize the crew bus, and hustle his copilot with the flight bag left him feeling pooped even before he got to the aircraft.

The period before takeoff had been like one of those nightmares where, run as he might, he couldn't get anywhere. He managed to preflight the interior, load the baggage, brief the pax in quick time—only to spend the next 5 minutes cooling his heels as the copilot completed his slow, deliberate exterior check. Then, after they'd reopened the entrance door to load the coffee and water, sorted out the dispatcher's queries on their flight plan, and held for 10 minutes while their clearance caught up with them (how could he have forgotten to put it on request as he strapped in?), he'd managed to get airborne.

From that point, he recalled, the trip just tilted more steeply downhill. It just wouldn't have been in context if they hadn't encountered 40 knots more headwind, and cirrus higher than they could climb, and the continual turbulence which soon had some of his pax looking extremely out of sorts.

By that time, the news from Metro that the front which originally wasn't expected until well after they'd come and gone, would now be awaiting him at his destination, didn't come as any surprise at all. He thought he'd done a good job of briefing the approach, and the wet runway landing, and what he expected from his neophyte cohort in the right seat. He'd just about caught up with things as they started down out of 390. The half dozen attempts to get hold of dispatch on the way down had been quickly relegated to the status of routine irritant. Even the rain and icing, just as they hit the final approach fix, hadn't distracted him too much. If that Approach turkey had given him a better cut at the fix, he'd have had it all wired. Still, that's why they'd put the speedbrake there.

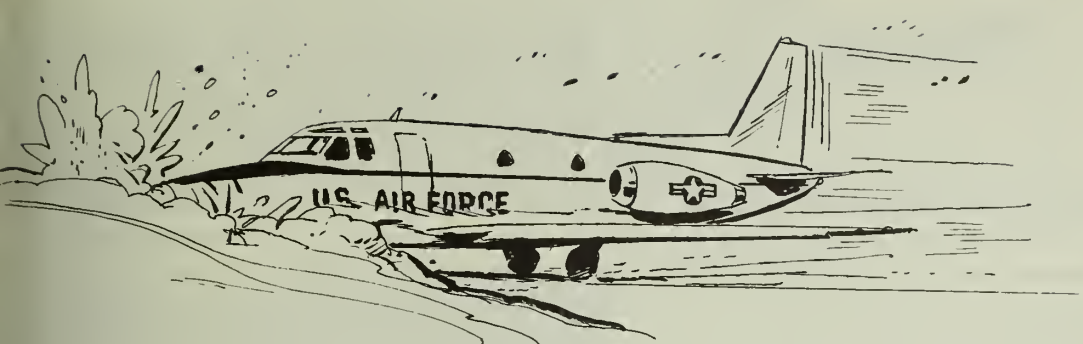
The ILS wasn't as good as it could have been, thanks to the crosswind. When they broke out a couple of hundred feet above minimums, he'd maneuvered across to regain the centerline and set himself up for the min run landing. He'd even adjusted his final approach speed to account for the gusty conditions.

Even now, some little time later, he was still a bit hazy about all the details from there. He'd managed to get the little Sabreliner over the threshold in pretty good shape, when suddenly the aircraft buffeted and rolled sharply right. He'd picked the wing up with full and added power, just as th way came up with a dreadf and stopped their precipitc scent with a bone rattling As he fought to keep it strai felt the aircraft lurch just b started to drift left. He'd somewhat under control u knots, when it veered sharp again and nosedived into the bank beside the runway.

Well, he'd managed to passengers out of the overw cape hatch in reasonable ord it hadn't been hard to figu that the combination of a blo tire and his not engaging nos steering had caused the airc depart the runway. But, he v a bit puzzled about why the had rolled so sharply on shor And, the way the passenger now acting on the ride in t Ops, you'd think it was *h* that the general had slipped ice-covered right slat as he and tore the seat out of his ers!

* * * *

The problems that prof flyers face in staying curre well known, and those of m combine large steel desk (LS ing with the other kind have perienced the pressures (ho



all at once!) that our hero had
ice. Mostly, we manage to over-
e all these and worse, and com-
the mission. We all know that
y would have had a better
ce of keeping himself out from
nd the 8-ball if he'd:

Established a regular manuals
w program.

Flown at consistent intervals.

Managed an occasional local
er (preferably with an IP).

Made more use of the trainer/
lator program (there's a sign
e wall of the trainer room at
ase which says it all: "Better
down here wishing you were
ere, than up there wishing you
down here.").

Not allowed himself to be
d through the preflight phase
when the DV shows up early,
it?).

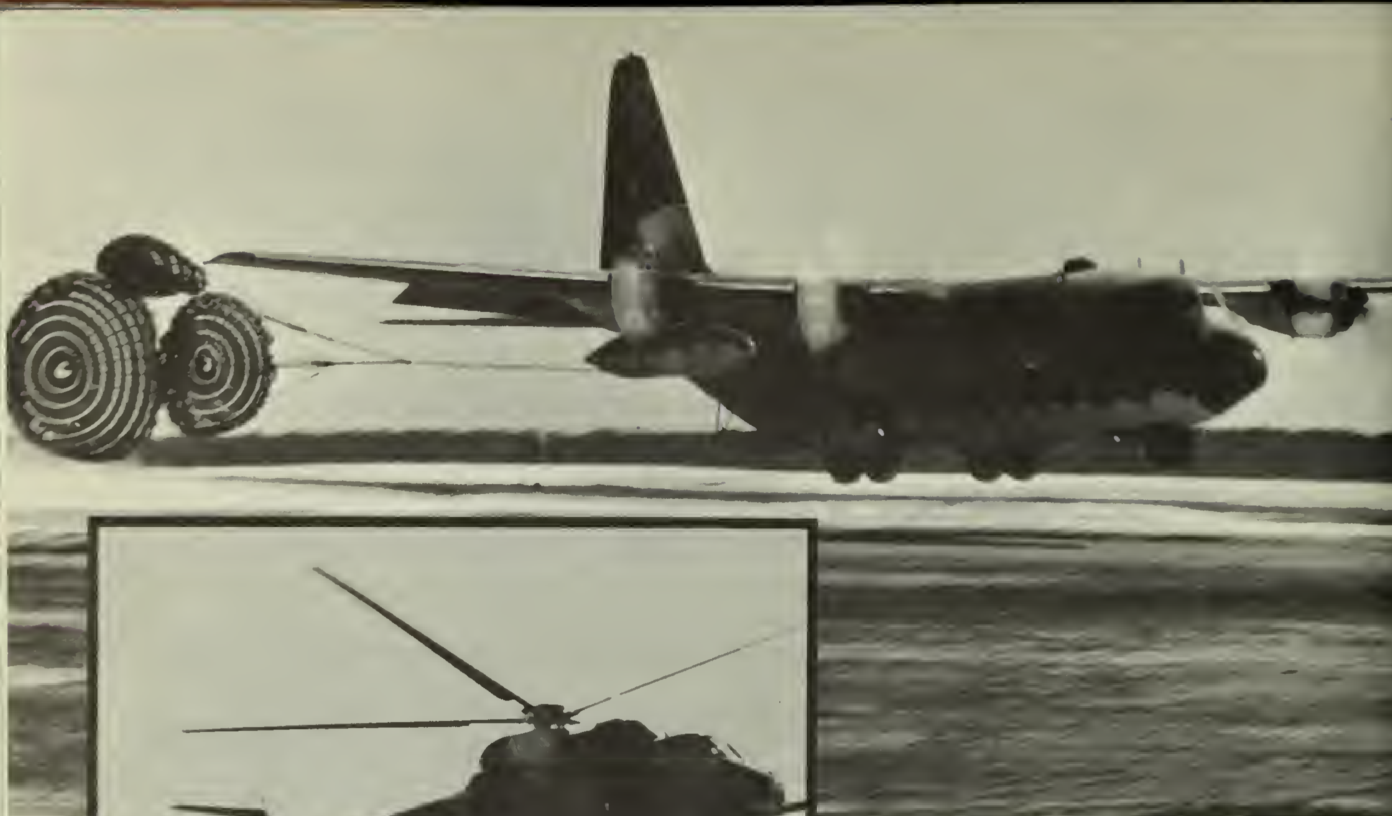
Planned ahead a bit more on
the new conditions at destina-
would affect his operation.
, he remembered the min run
g, and the gusty wind condi-
but completely forgot the ef-
hat an iced up slat on one side
l have on his aircraft's per-
nce; and didn't check it. Such
s can ruin your whole day, not
ntion the general's pants.)

e following list of questions
riginally published some years ago, but its validity to today's proficiency flyer, and indeed to all flyers, remains unchanged. It was originally devised by the then Major Laree D. Chetelot, AFSC, and published in AFSC *Professional Approach*.

1. Do I wait until the last minute to notify scheduling when I am unable to keep a flying commitment?
2. Do I continually turn down weekend and night flights because of other commitments?
3. Do I show up at Base Operations so late that there isn't time for adequate flight planning before takeoff?
4. Do I study aircraft systems and procedures only before a flight check?
5. Do I wait until the last part of the 6-month period to complete a proportionate share of flying hour requirements?
6. Do I expect a flight examiner to tell me during the flight check what I already should know?
7. Do I ignore letters or scheduling forms when a reply is requested?
8. Am I frequently "too busy" to return a phone call to flight operations?
9. Do I frequently cancel or reschedule training flights?
10. Do I feel that my responsibilities in the office are so pressing and important that I can't afford 2 or 3 days away on an extended flying mission?
11. Do I neglect to keep myself current on flying publications, regulations, technical orders, and changes thereto?
12. Do I spend so little time practicing emergency bold face items that my reactions are questionable when the situation develops?
13. Do I feel slightly apprehensive strapping into the pilot's seat because I haven't flown for 30 days or more?
14. Do I consider my office duties so pressing that I don't have time to attend flying safety or aircrew meetings?
15. Do I feel that I have not given the flying job my complete support because that is not where my OER is written?
16. Do I tend to rely heavily on the other pilot to handle unusual circumstances instead of being personally on top of all situations?

I submit that even a single "yes" answer to any of these questions is grounds for self-examination.

By the way, you'll be pleased to know that a month after his little adventure Rippy was Qual Level 1 on "No's"! Don't wait for a sparring session with a snowbank before you can say the same. ★



Above—Reserve C-130 crew maintaining proficiency on air dr
missions. Left—The AF Reserve supports MAC in air rescue
missions. Below—Reserve technicians loading weapons on on
assigned Reserve aircraft.

Maj Gen Richard Bodycombe, Vice Commander of AFRES, Right, and Maj Gen William Lyon, Commander, Air Force Reserve, Left, holding the Major General Benjamin D. Foulois Memorial Award trophy

AFRES WINS FOULOIS TROPHY

COL TED OGLESBY
bilization Augmentee AFRES

he Air Force Reserve has won the coveted Foulois Trophy for operating the best flight ety program in the Air Force ng 1977.

he trophy, named in honor of or General Benjamin Foulois, early Chief of the Air Corps, is ented during the annual con- ion of the Order of Daedalians. or General William Lyon, Com- der of AFRES, accepted it in Antonio, Texas, 3 June 1978. as the first time AFRES had the award.

FRES aircraft flew more than 000 hours with only five re- able accidents during 1977. than 43,000 of the hours in fighters. Three of the re- able accidents were of the r variety with damage less $50,000 while the other two ted in destroyed aircraft. e was no loss of life.

one instance, where an air- was destroyed, the reserve won the Koren Kolligian Tro- or the best feat of airmanship e Air Force in saving lives roperty.

C-123, piloted out of West- AFB, Massachusetts, in Octo- 977 by Major Gale French, n inflight engine fire. Maj n piloted it safely to the run- way saving all lives aboard though the aircraft was destroyed.

The other destroyed aircraft was an F-105 which had engine failure. The pilot successfully ejected.

The loss of both aircraft could be attributed, at least in part, to the age of the aircraft, according to Lt Col Thomas A. Duke, AFRES Director of Safety.

The Air Force Reserve, Col Duke pointed out, operates under such unique circumstances that the winning of the Foulois Trophy becomes even more significant and meaningful.

- AFRES, with the Air National Guard, has the oldest hardware of any of the flying commands. Though some reserve crews fly in associate units with active duty counterparts in the most modern aircraft, most units have the older equipment.

- AFRES has more weapon systems than the other commands. Its units are gained in time of mobilization by four different commands (MAC, TAC, SAC and ADCOM).

- The aircraft inventory includes the C-5, C-9 and C-141 flown by the associate units and the A-37, C-7, C-123, C-130, AC-130, KC-135, EC-121, HH-1, HH-3, CH-3 and F-105 flown by other reserve units.

With more weapons systems, there are more diverse interests to be melded into the command-wide flying safety program. Missions include the routine and the emergency. There are, of course, the routine training flights. More often, these are productive cargo-carrying missions that otherwise would have been flown by active duty personnel. Not at all unusual are the emergency relief missions where flying conditions are frequently more dangerous.

Gen Lyon illustrated the diversity of the missions by pointing out that many reserve aircraft supported Red Flag exercises. Additionally, C-130's flew rotational South American routes from Panama, F-105's deployed to Europe, and we activated our KC-135 refueling mission and participated in Exercise Bold Eagle. We provided much of the airlift support in year-long disaster relief and airborne fire-fighting operations." Reserve crews helped with the Buffalo (NY) snow relief and California fire-fighting efforts.

Safety officers also are concerned with training reservists who are on board only a few days at a time.

Col Duke attributed the first-ever accomplishment in part to AFRES developing its own flying safety program instead of trying to follow all the diverse programs of the various gaining commands. "We consolidated the appropriate elements from TAC, MAC and SAC programs and incorporated the best and the appropriate features into our own program," he explained. "All our safety people have to be instructors too."

"Another factor in achieving the record," he said, "is a more realistic training program than before. We now fly like we would actually fight. This is a morale builder. We

try to do something the active force does and find we are quite good at it. The resulting high morale is a super plus for the safety program."

He said, "There is tremendous support from the other staff agencies. A lot has to be crammed into the weekend training assemblies, and it requires close coordination, efficient scheduling and sacrificial cooperation, all made possible by relentless command emphasis."

All these factors—particularly the age of the aircraft and the shortness of available time—combine to require unusual initiative at the lowest field level to get the job done.

Though this is the first time in history AFRES has won the trophy for the best command-wide flying safety program, flying safety is habitual to a number of individual units which have 20 or more years without a chargeable aircraft accident.

Heading the list is the 64th Tactical Airlift Squadron at Chicago's O'Hare which hasn't had an accident since its activation more than 31 years ago on 5 April 1947.

Three more units also never have had a chargeable accident since they were activated at least a quarter-century ago. They are the 327th TAS at Willow Grove, 355th TAS at Rickenbacker, and the 303rd TAS at Richards-Gebaur.

The remaining five have had no accidents in the last 20 years or since they were activated. They are the 704th TAS at Bergstrom, the 96th TAS at Minnesota-St. Paul, the 731st TAS at Westover, the 305th ARRS at Selfridge and the 336th AREFS at March.

The year 1977 saw more laurels added to the flying safety records of various units. Reaching the 75,000 hour of no-accident flying was the 940th AREFG at Mather. The 924th TAG at Bergstrom reached the 50,000 hour plateau. Reaching the 25,000 hour mark were the 68th TAS at Kelly and the 908th TAG at Maxwell.

Five of the 50 flight safety plaques presented Air Force-wide went to reserve units. They the 919th SOS, Eglin AFB 304th ARRS, Portland; the SOS, Luke AFB; the 301st Carswell AFB, and the 433rd at Kelly AFB.

Col Duke worries that wi the award might make re fliers more complacent. "The ois Award hasn't been won ir secutive years since 1952, than a quarter-century ago, said. "It is easy to become placent, and that's when acci happen."

AFRES doesn't intend to come complacent, however. only does it intend to repea win in 1978, but it has been lenged to improve safety per ance in the industrial areas a and win the Secretary of th Force Award for the best o safety program in the total

Maj Gen Richard Bodyco Vice Commander of AFRES, "An improved flying safety formance and a reduction of ian injuries of at least 40 pe is the AFRES goal for 1978.

Lower L, a flight of F-105s, one of three tactical aircraft assigned to AFRES.
Right—The Reserve own and operate HC-130s with refueling capabilities.

NEWS FOR CREWS

nformation and tips to help your career from the folks at Air Force Military Personnel Center, Randolph AFB, TX.

CAPTAIN ROBERT ZEINER
Air Force Manpower and Personnel Center

M any officers who visit or call AFMPC have similar questions and concerns in most career management areas. This article addresses e of the most frequently asked questions.

STION: I've been on station for 3 years. When can I expect an assignment?

WER: Except for the maximum tours specified in AFR 36-20 (Air Staff, OJCE, overseas tours, etc.), AFMPC will not reassign an officer solely because a given time-on-station (TOS) has elapsed. The fact is, you could stay at your present base well beyond 3 years—until a requirement arises to generate a PCS for you. High TOS is still an important consideration. When all other pertinent factors are equal, the officer with the longest TOS will be selected to fill a requirement.

TION: Can I move before I complete 3 years TOS?

ER: On 1 May 1978, AFMPC implemented policies designed to comply with DOD guidance requiring 3 years TOS before CONUS-to-CONUS PCS moves are allowed. The authorized exceptions permitting PCS prior to 3 years TOS are:
1. Shorter tours listed in AFR 36-20 (such as ASTRA, USAF IG duty inspectors, certain departmental and joint tours, etc.).
2. Students attending PCS schools.
3. Assignments to overseas area (2 years TOS required).

The 3 year TOS requirement is an important part of the Air Force plan to reduce PCS turbulence and conserve PCS funds. Longer time on station will offer you some excellent opportunities. Setting up a program to finish your degree or to pursue an advanced degree will be easier. The option of completing advanced PME via on-base seminar will be much more attractive with increased PCS stability.

ION: Do all rated jobs include flying?

R: No. Many (in fact, over 3700) Air Force staff positions require a rated officer, but do not include mandatory cockpit duties. These positions usually carry 14XX or 22XX AFSC's.

QUESTION: I just finished my master's degree. Who do I call at AFMPC to get it on my records?

ANSWER: All academic information is now entered into the Advanced Personnel Data System (the computer) by AFIT at Wright Patterson AFB. The place to start is your Base Education Office. They can get the right information to the right people in minimum time. The Base CBPO (officer records) can check to verify that your records were updated correctly.

QUESTION: Can I visit AFMPC to check my records on a Saturday?

ANSWER: Yes. If you call the AFMPC Records Review Section at AUTOVON 487-2996 during normal duty hours, they will leave your records with the AFMPC Staff Duty Officer for viewing upon your arrival. Career counseling with a resource manager will normally not be available.

By the way, if you are planning to fly in, don't forget to check the IFR Supp. Randolph has some pretty exotic PPR and operating restrictions.

QUESTION: What assignments will be available for me 6, 9, or 12 months in the future?

ANSWER: This question is a difficult one to answer. The assignments that will be available in the future depend on many factors, not all of which may be known at the time of your question. For example, if you want to be assigned to a MAJCOM plans shop next summer, we may look at our manning documents and show no projected vacancies. However, officers presently in that organization may be reassigned PCS, retire, or separate—creating vacancies that were unknown when we were talking to you. Also program changes, authori-

zation increases and deletions, and changes in management emphasis will certainly influence what is "available" for you in the future. Also, many positions are "nominative" in nature, and require acceptance by the gaining organization before they become truly "available" to you. The best we can do in some instances is counsel you on the general areas and types of duty for which you are qualified. Pinning it down to a specific agency, division, des particular aircraft cockpit can be difficult (if not impossible) when ta beyond 4 to 6 months in the futur

NEWS FOR CREWS is written by the AFMPC R Officer Career Management Branch. If you ha question you would like answered in this col send it to:

NEWS FOR CREWS
AFMPC/MPCROR
Randolph AFB, TX 78148 ★

MAIL CALL

CLASS RING

Your publication continues to highlight salient aspects of flight safety—good show!

I did note on page 12 (April 1978, **Aerospace Safety** magazine) the C-141 pilot cruising at X7600 feet indicated is wearing his class ring—very fitting for an article on complacency. It must be time to run your "missing ringfinger" photos again. Fingers departing hands make a nasty popping sound and can ruin your whole day. For the married troops, if your bride thinks rings come off when the gear comes up for nefarious reasons, assure her she's wrong —they come off before flight so they don't come off forever.

ROBERT A MANNS, Lt Col, USAF
Life Support System Manager
San Antonio Air Logistics Center
Kelly Air Force Base, Texas

CLASS RING II

You folks put out a lot of good information for the jocks in the field, however, the picture which accompanied the article, "The Automatic Complacency," April 78, also pointed out a degree of complacency on the part of the intrepid aviator in the left seat. He was wearing a ring on his right hand which is in violation of AFR 127-101 para 88-4g(2). This would have gone unnoticed, of course, had the pilot been wearing his nomex flying gloves. I'm sure this was just an oversight, keep up the good work.

RANDOLPH F. LEBER, Capt, USAF
Chief, Quality Control
552d Airborne Warning and Control Wing
Tinker AFB OK

MINIMUM FUEL, EMERGENCY FUEL, OR EMERGENCY

MAJOR JOSEPH R. YADOUGA
Directorate of Aerospace Safety

When is the last time you declared "Min fuel," "Emergency fuel," or a fuel-related emergency? What did you mean, and what did you expect air traffic control (ATC) to do for you? What situation does the following definition refer to? "________fuel" indicates recognition by the pilot that his fuel supply has reached a state where, upon reaching destination, he cannot accept any undue delay. If you said "Min fuel," you're right. "Min fuel" is not an emergency situation but merely an advisory that indicates an emergency situation is possible should any undue delay occur.

The above definition and explanation are taken from FAA Handbook 7110.65, *Air Traffic Control.* It goes on to say that common sense and good judgment will determine the extent of special handling to be given in such situations.

What does this mean to me as a pilot? It means that I should not expect any priority from ATC if I declare "Minimum fuel." If my state is so critical that I can' ford any routine delays, then I no choice but to declare an e gency. That can be done by de ing "Emergency fuel" or by de ing an "emergency" and tellin controlling agency the nature c emergency—insufficient fuel su

Once an emergency is decl ATC will "provide maximum a ance to aircraft in distress." F 7110.65 further tells the contr "Obtain enough information to dle the emergency intelligently. your decision as to what type c sistance is needed on inform and requests received from the because he is authorized by FA to determine a course of actio

To summarize, if you have a problem that requires priorit special handling from ATC, de an emergency. Don't try to bea system by declaring "Min fuel" hoping to get down without problems. ★

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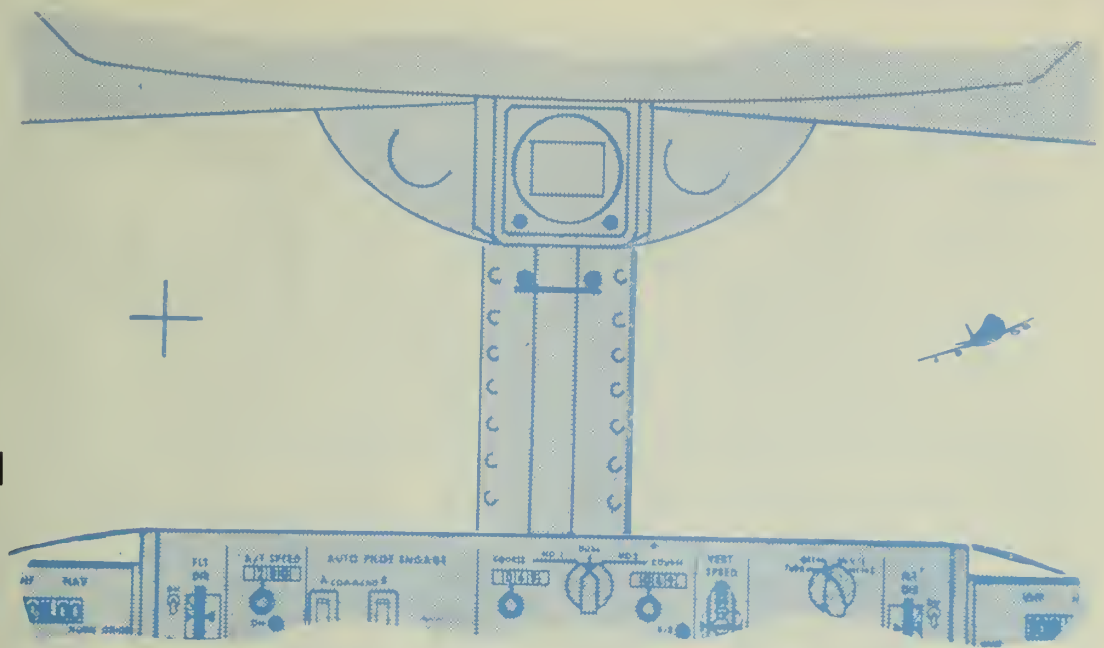


aviation today, in spite of so-
histicated air traffic control and
avigation systems, the see-and-
d concept is still a most im-
ant element in collision avoid-
:. To make the most of this con-
, we should know our sight
ations. One little known limita-
of the human eyeball is the
l spot where light strikes the
: nerve. In most eyeballs this
l spot is about 30 degrees right
enter, looking straight ahead.
both eyes open and vision
structed by objects, the blind
s of each eye are cancelled by
eripheral vision of the opposite
The brain combines the image
the blind spot disappears.

it what happens when periph-
vision from the opposite eye is
ucted by an object such as a
shield centerpost? Now the
cannot fill in the image. How
is the void? It's about a one-
-half degree cone diverging
the optic nerve. Under some
tions it could block instru-
s from view and will blank out
7 one mile away. A 747 will
pear at a mile and a half.

You can find your blind spot on the picture above. Hold the picture at arms length with both eyes open, focusing on the cross on the left windshield. Then bring the picture in until it is almost touching your face. With both eyes open you should not lose sight of the 747 in the right windshield. Now close your left eye and try it again. Keep your right eye focused on the cross as you bring the picture in toward your face. The 747 will disappear, then reappear as you draw the picture closer.

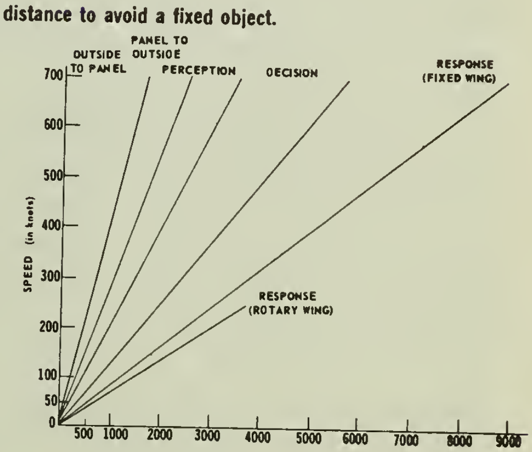
When your blind spot limitation is combined with empty field myopia (the tendency of the eye to focus at about 3-4 feet when there is nothing to focus on), you can really appreciate your visual limitations under the best CAVU conditions.

If you have ever grumbled about slowing below 250 knots in terminal areas, the charts below may alter your perspective. They were developed by the University of Southern California Safety Center for an SST collision avoidance project. Pilots were assumed to have normal 20/20 vision and average reaction time. (Crosscheck) ★

Minimum time and distance to avoid a fixed object.

		OPERATION	TIME (in seconds) ITEM	TOTAL
OUTSIDE TO PANEL VIEWING	1.	Muscle movement	0.175	0.175
	2.	Eye movement	0.05	0.225
	3.	Foveal perception	0.07	0.295
	4.	Accommodation	0.50	0.795
	5.	Recognition of instrument reading	0.80	1.595
PANEL TO OUTSIDE VIEWING	6.	Reaction time	0.175	1.770
	7.	Eye movement	0.05	1.820
	8.	Relaxation of accommodation	0.50	2.320
	9.	Foveal perception	0.07	2.39
PERCEPTION	10.	Sensation (retina to brain)	0.1	2.49
	11.	Motor reaction (prearrange eye movement)	0.175	2.87
	12.	Eye movement	0.05	2.72
	13.	Focus fovea	0.07	2.79
	14.	Minimum recognition	0.65	3.44
DECISION	15.	Decision (est. minimum)	2.0	5.44
RESPONSE	16.	Operating controls	0.40	5.84
	17.	50-foot vertical clearance	1.73[a] 2.73[b]	7.57 8.57

a = fixed wing b = rotary wing



CAPTAIN
Edward P. Rosenthal

MAJOR
Timothy G. Scofield

20th Tactical Fighter Wing

On 9 December 1977, Captain Rosenthal, aircraft commander, and Major Scofield, weapon system officer, were flying in an F-111E aircraft as number two in a two-ship formation flight. The flight had descended to 3,000 feet AGL in an attempt to enter low level, but due to low clouds they were unable to continue, and a climbout was begun. As Captain Rosenthal advanced the throttles to military and began climbing, there was a loud thump accompanied by airframe vibrations and a significant left yaw. They first observed the right engine rpm was decreasing and assumed the right engine had compressor stalled. As the throttle was retarded toward idle, Captain Rosenthal saw that the left engine had also rolled back, and the left rpm was stable at idle. The right throttle was returned to a military setting, but both engines remained at idle rpm. The airstart button was depressed to ensure auto ignition in case the engines flamed out. As the button was pressed, the right engine recovered. During recovery attempts, the aircraft lost 700 to 800 feet and 100 knots of airspeed. While being vectored toward the nearest landing field, Major Scofield started checklist cedures for recovering the left engine. The engin shut down and restarted, but the throttle could n advanced above 70 percent without loud engine bling and airframe vibrations. Captain Rosentha Major Scofield decided to leave the left engine a to furnish hydraulic pressure in case of another lem involving the right engine, and continued the proach using single engine landing procedures i strange field with a 700-foot ceiling and 1.5 mile ibility. The elapsed time from the dual stalls unt aircraft was safely landed was less than 10 mi Inspection revealed that a fiberglass intake par the left intake had debonded and been ingested b left engine. The sudden loss of thrust from th engine had caused the yaw, and this yaw induce right engine rollback. If not for the timely and p actions taken by Captain Rosenthal and Major field, this compound emergency in marginal we conditions could have resulted in the loss of a val aircraft. WELL DONE! ★

☆U.S. GOVERNMENT PRINTING OFFICE 789/

STATES AIR FORCE

Well

Done

Award

resented for

nding airmanship

professional

rmance during

ardous situation

nd for a

ant contribution

to the

States Air Force

dent Prevention

Program.

CAPTAIN

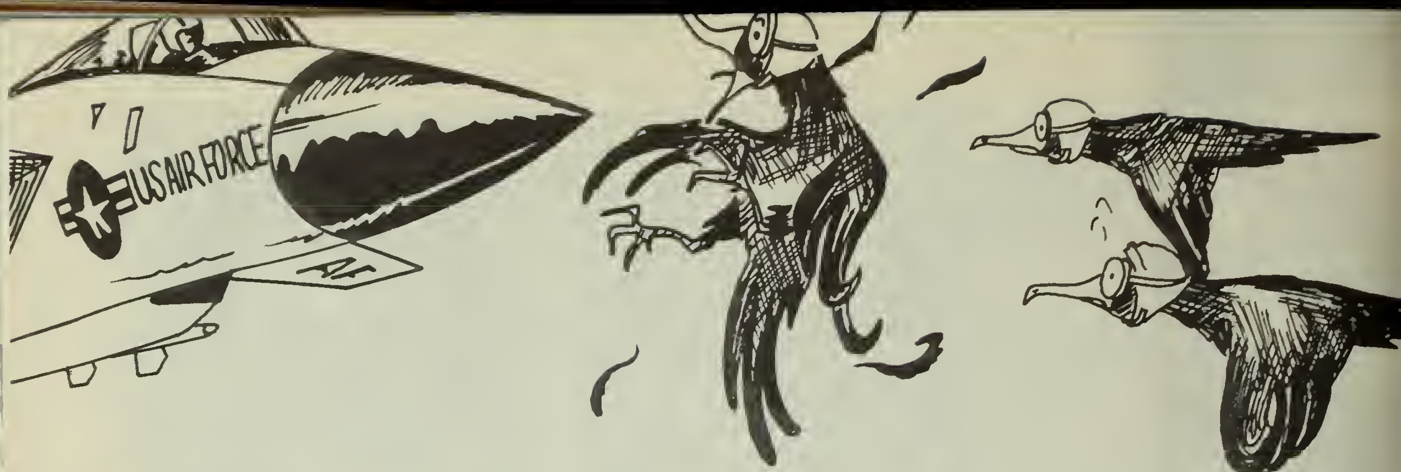
Alvin G. Green

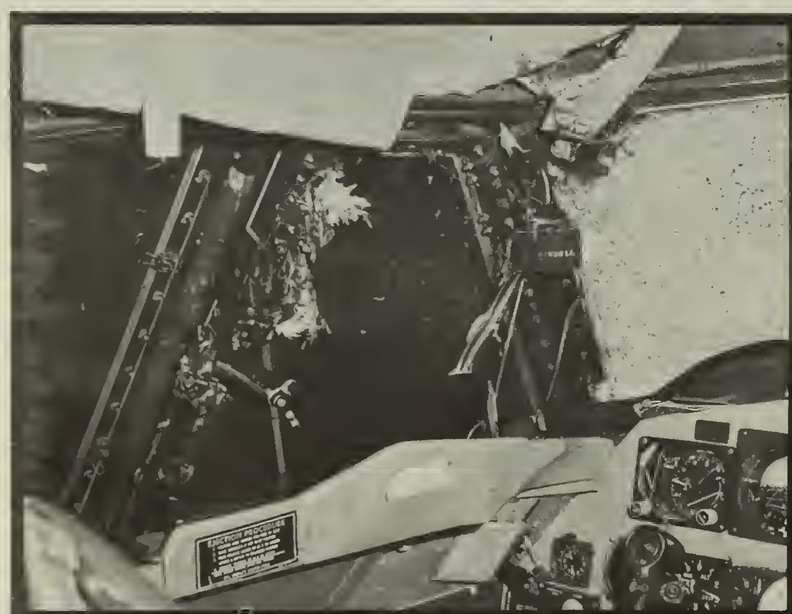
CAPTAIN

Peter V. Voorhees

704th Tactical Air Support Squadron

On 3 January 1978, Captains Green and Voorhees were flying in an OV-10A, the second aircraft in a flight of four, on a local training mission. The flight had conducted rocket qualification and were returning to home base for a night termination landing. Due to severe weather conditions at the home field, the flight had to divert to another base for recovery. Upon arrival at the alternate airfield, the flight separated for individual approaches and landings. On an 8-mile final, and over a densely populated area at 1,500 feet AGL, the left engine failed without warning. Approximately 15 seconds later, the right engine also flamed out. Captain Green and Voorhees evaluated the emergency situation and decided there was sufficient time to make one airstart attempt, while clearing the populated area, before ejection became necessary. Captain Green initiated airstart procedures on both engines simultaneously, while Captain Voorhees closely monitored and compared the engine instruments and the aircraft attitude and altitude. Successful restarts on both engine were completed by 500 feet AGL. Captain Green continued with the approach and made an uneventful landing. The engine failures were later determined to be caused by material deficiencies within the engine fuel system. The prompt, correct evaluation and timely actions of Captains Green and Voorhees during this critical in-flight emergency attest to their superior abilities and outstanding airmanship. WELL DONE! ★





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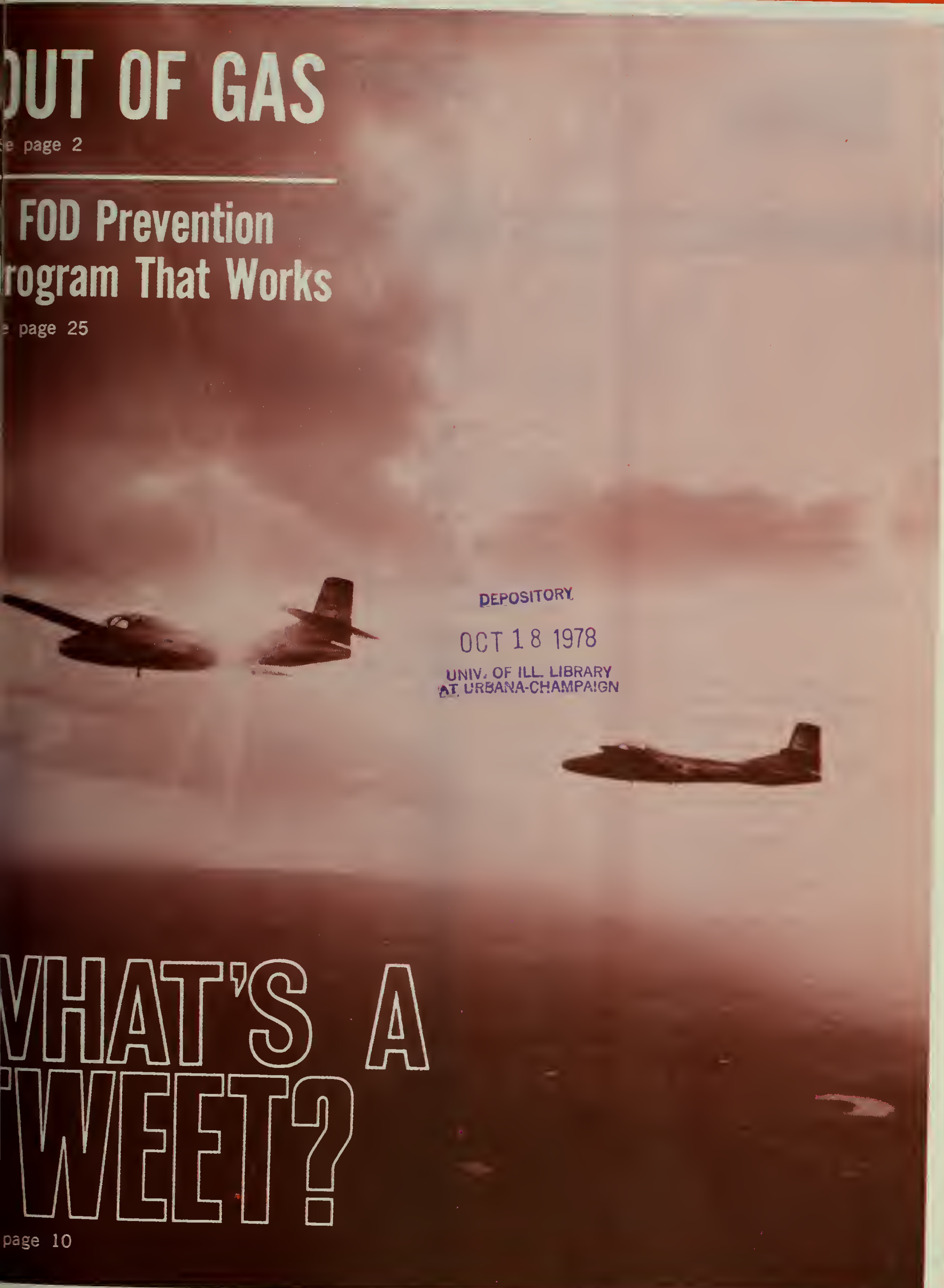

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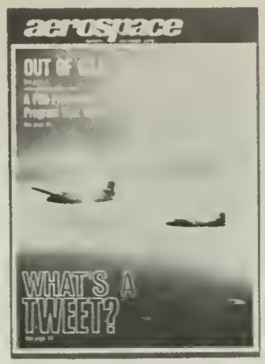
VHAT'S A
TWEET?

page 10



UNITED STATES AIR FORCE

aerospace SAFETY

THE MISSION - - - - - - SAFELY!

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, US

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OCTOBER 1978 AFRP 127-2 VOLUME ~~35~~ 34 NUMBER 1

VHO'S DOING THE FLYING?

e never thought it could happen to him. Ever heard those words? Sure you have, ou've thought to yourself that are a lot of things—mostly -that you are convinced never happen to you. Now ptimism is good; in fact, it at helps us cope with dous situations.

example, we have all read aircraft accidents and thought selves that that couldn't n to me. Take the airliner rashed in the everglades a few ago. It was a dark night, no there, and the aircraft was to land at Miami when a gear ailed to illuminate. No big The cockpit crew began con- ting on replacing the bulb to tent that no one was flying plane. When this event ed the aircraft was low— os a couple of thousand feet. remember it, you'll recall e aircraft *flew itself* into ound with no help from the

you can imagine something at happening to you and your disciplined, professional

It was an early morning, before daylight, takeoff and short flight to a DZ for the transport. Routine, ho-hum. By the time they arrived at the field, the before landing pattern checklist had been completed. After a turn to miss some clouds and stay VFR, the crew began a descent and completed the before landing checklist. However, when the pilot saw the field, he believed he was in too close and started a turn to a new pattern to lose altitude.

On downwind the pilot couldn't see the runway, but he had the copilot and nav looking out for traffic and the runway and they okayed a turn back toward the runway. After a few turns to orient himself, the pilot decided he was too close so he made an angling turn to approximate a right base. Just then the nav said he saw the ground and the pilot and flight engineer felt the aircraft buffet. Immediately the pilot called for flaps, added power and lowered the nose.

Too late.

The aircraft stalled and struck a small hill just a couple of hundred feet above runway elevation. It was totally destroyed by the impact and fire damage.

As in the Everglades accident, this crew was so preoccupied with something else that their attention was diverted from the critical task of flying the airplane. Locating the runway was important, but nothing—nothing—is more important than flying the airplane. All else is secondary, as this accident indicates. While the airspeed decreased, no one was watching. Finally the aircraft stalled, and despite the pilot's best efforts, crashed.

Basically there are two points to be made from this narritive. We've made one—someone has to *fly the airplane*. The other is that organized effort to accomplish a task or set of tasks which we call *crew coordination*. With it, with each crewmember performing his assignment, an accident such as this would never occur. We're not going to beat this theme to death, but merely observe that had these two points, flying the airplane and crew coordination, been strictly adhered to over the years, the accident files would be very much skinnier. ★

WE ARE OUT OF GAS!!

CAPTAIN KENNETH S. HARVELL
4235th ISD Sq • Carswell AFB TX

I can't believe it's happening to me; I know I computed my fuel requirements cor-
ly; I just can't be out of gas."
many pilots in the course of
tion history must have found
e thoughts racing through
minds when their engine
hed and sputtered followed by
unnerving quiet of their air-
e gliding unpowered through
air?

e have all read articles and
training films depicting a
ap that was caused by some
erjock's inattention to his
status, and for those of us
fly the heavies with enough
nes and gas to go halfway
nd the world, the possibility
nning out of gas on a routine
ng mission seems totally
te.

eryone who has manipulated
uel panel in multi-engine air-
s has made mistakes that
led to some embarrassing
rs of gravity, both fore and
nd on occasion an engine
out, but to completely run
f gas on a training mission—
couldn't happen. However,
al years ago a KC-135 crew
a routine training mission
nice summer day managed
just that. This is what
ened.

e crew was scheduled for a
our pilot proficiency mis-
The pilot and copilot had
an earlier check ride, so an
ctor pilot flew with the crew.
-back landing was scheduled
to pick up a standboard instructor pilot to recheck the copilot on an ILS approach and complete his annual instrument check.

Everything was normal for the first 4 hours. The taxi-back landing to pick up the standboard evaluator was uneventful, and the IP deplaned. There were 15,000 lbs of fuel remaining which was adequate to complete the two scheduled approaches and land with the required fuel reserves, but the evaluator was faced with a dilemma. The ILS at home base was NOTAMed out for repairs, so he had to decide whether to cancel the rest of the mission or fly to a nearby base to complete the check ride.

When the first IP deplaned he told the evaluator that he felt there was insufficient fuel to fly to the alternate and return. The pilot and copilot had discussed the plan, and they too agreed that they could not safely make it to the other base and return home. The desire to complete the mission and fill that square must have been very strong because the evaluator, after quickly computing the fuel required mentally, requested a 30-minute overflight and decided to go to the other base. This was against the advice of the other three pilots.

What in the world possessed the evaluator to "press" on such a routine mission? This is conjecture, but my view of the crew force over the years leads me to believe that it must have been a case of "mission lock-on." This man was in a position of leadership within his wing that was undoubtedly earned by getting the job done. Mission is the reason we all fly, but in this case it may have resulted in tunnel vision that prevented even a cursory review of the consequences. The chart (page 4) shows the figures the evaluator said that he mentally calculated versus the fuel required taken from the performance section of the KC-135 Dash One. His altitude going to the alternate was 5,000 ft MSL; returning was 6,000 ft MSL.

	EVALUATOR	DASH 1
TIME ENROUTE/RETURN	30 Min	56 Min
TIME FOR APPROACH	Not considered	8 Min
FUEL FOR ROUND TRIP	6,000 lbs	12,700 lbs
FUEL FOR APPROACH	1,500 lbs	1,500 lbs
RESERVE	7,500 lbs	800 lbs
TOTAL FUEL	15,000 lbs	15,000 lbs

Evaluator's estimates of fuel required vs Dash One figures.

WE ARE OUT OF GAS!! continued

What caused this highly qualified and experienced pilot to miscalculate to this degree? He may have been thinking of the standard planning figures used at his base for this alternate. It called for 17 minutes enroute and 2,600 lbs of fuel. The kicker was that these figures were based on an altitude of FL330.

The flight to the alternate base took 25 minutes, and when they arrived they were vectored for an ILS. Either before or during the ILS the crew discussed the fuel status. The pilot and copilot recommended to the evaluator that they land and refuel, but the evaluator decided to return home based on his original estimate of 3,000 lbs enroute fuel. He further stated he thought that he had 10,000 lbs remaining; however, he had just computed a touchdown speed for the ILS approach that, from performance data, indicated fuel on board of 5,000 to 6,000 lbs.

During the return to home base, apprehension continued to increase, and the boom operator stated that he computed three possible center of gravity figures including one with no fuel remaining in the forward body tank where most of the fuel reserve would normally be located because of center of gravity requirements. Even though the crew was concerned about the fuel status, they did not take a fuel reading or check the performance data in the Dash One, and no one suggested that they return to the alternate for more fuel.

As the fuel status became more critical the evaluator who was in the pilot's seat shut down engines

2 and 3 to conserve fuel while the rest of the crew prepared to bail out. As the evaluator was descending for the approach at home base, the number 1 engine flamed out and he immediately initiated a restart on engines 2 and 3. His altitude was between 2,500 and 3,000 feet. At this time, the boom operator decided it was time to exit, so he released the emergency exit hatch and bailed out, and when the rest of the crew saw the boomer go, they immediately followed. The evaluator felt that he had power and could make the runway, so he stayed with the airplane. He cancelled his IFR clearance and tightened his pattern. During his turn to final the rest of the engines flamed out.

He lowered the gear and got a
down and locked indication a
placed the flap handle to 30 d
grees. The airplane touched c
640 feet short of the overrun,
skipped to 147 feet short of t
overrun then rolled onto and
the overrun and runway. He
turned off at the first taxiway,
3,000 feet from the approach
of the runway.

Miraculously no one was h
and there was only minor dam
to the airplane. When mainte
checked all the fuel system co
ponents they found everythin
be operating normally. They
fully drained the fuel from ea
tank and manifold and found
gallons of fuel which equates
461.5 lbs.

Could this happen to you?
pilot and evaluator had over
hours of flying time each. The
weather was beautiful and th
mission was simple, yet beca
they hastily planned a change
their flight without using tech
data and disregarded fuel res
requirements outlined in Air F
and command directives, the
seemingly impossible did hap

The possibility of history re
peating itself is very real. The
may be a few adverse circum-
stances added to the next acc
such as bad weather at your in
tended landing base or maybe
your gear or flaps will malfunc
tion, increasing fuel consumpt
but these problems are often
come by Air Force crews arou
the world. At best, they will be
weak excuses for poor plannin
that is, of course, if you are
around to use them. ★

NEWS FOR CREWS

Information and tips to help your career from the folks at Air Force Military Personnel Center, Randolph AFB, TX.

LT COL JIM WILLETTE
Deputy Chief, Rated Officer Career Management Branch
Air Force Manpower and Personnel Center

FICER CAREER OBJECTIVE STATEMENT— THE AIR FORCE FORM 90"

ave noticed that many Form 90s are terribly out-of-date. derstand why I consider this so important, let me explain ple of ways your Form 90 is used in the assignment selection ss.

t, let's examine the normal assignment process for you as d officer. Nine months prior to your being "available" for ment, your assignment folder is reviewed by the Rated Officer Board (RORB*). To be "available" for assignment, you ave an established DEROS from overseas, be completing a supplement tour, graduating from PME or AFIT, finishing an ff tour, or released for assignment by your MAJCOM. Addi-, if you are nearing three years time-on-station in the and are not in any of the previous categories, you will reviewed for possible reassignment.

primary job of the RORB is to review your records and recommend you for a rated or nonrated position. Recom-ions would include Air Staff duty, aircrew or staff positions a MAJCOM, supplement extensions or curtailments, or sup-t duty. One of the most important instruments used by the is your Form 90. We (I am a member of the RORB) are irvoyant. To know what you want to do, we must have a 0. All of us know that a Form 90 will not guarantee you rst or even second choice of assignments; however, with elp on your part (a complete, updated Form 90), perhaps get close. I will guarantee you this much: give us a Form we will do all we can to match your desires against re-nts. An appalling fact is that over half of the officers re-by the RORB either have no Form 90 at all or one that is y out-of-date.

ond use for the Form 90 occurs when resource managers ng to find volunteers to go overseas, change weapon sys-ove to staff or supplement positions, etc. Because there ut 25,000 pilots and 12,000 navigators** in the active in-it is impossible to remember who wants what type of erefore, an initial "scrub down" of possible candidates is ished via the computer. We look for volunteers who meet criteria first, and turn to nonvolunteers second. The job ted may have been yours had your Form 90 reflected your desires. By the way, there are 39 different pieces of information on your Form 90 stored in the computer. Take a look at the circled numbers as that's what can be retrieved via the computer when looking for volunteers. The "bottom line" is this: with an out-dated Form 90, you may either **not be considered for a job you want,** or, worse yet, **be considered** (and maybe selected) **for a job you do not want!**

Okay. Enough said on why you need a current Form 90. Let me wrap it up with a few hints about how to fill one out. First, fill it out completely. If you want to change only one or two parts of the form, do so, but be sure the rest of the spaces are filled in with what was there previously. This precludes second guessing on our part on whether or not you still want whatever was not changed. Nor does the individual at the CBPO know whether to change all or just a few of the 39 pieces of information stored in the computer. "No harm—no foul" only counts in the NBA. Second, fill out the Remarks Section of the form with any additional information you want us to know. Regrettably, the data in the Remarks Section cannot be input into the computer, but during the normal assign-ment cycle (the RORB) we will certainly read it. Third, give us some options. Give us both rated and nonrated choices with more than one choice in either type of duty. Also, give us more than one base or geographic area to choose from. Fourth, you may want to choose between jobs or geography. For example, if you are con-sidering retirement at the end of your next assignment, no doubt geography will play a great part in your choice of assignment. (Good item for the Remarks Section.) However, if you have greater interest in job potential, don't tie us to geography. The more places you are willing to go, the more jobs that are available. Lastly, if your Form 90 still does not say it all, write us a letter. We will put both your letter and our answer in your assignment folder for use when your next assignment comes up.

Thanks for hearing me out. If you are one of the many without a current Form 90, schedule yourself an hour next week to go to your CBPO and bring it up-to-date. It will certainly be time well spent. ★

*The RORB consists of the Chief or Deputy Chief of the Rated Officer Career Management Branch, Chief, or Deputy Chief of the Support Officer Career Management Branch, a member of the Rated Supplement Manning Section, and a representative of the Force Utilization Branch.

**Lieutenant colonel and below.

OPS TOPICS

CLEAR THE RUNWAY

About a half mile out on final at 500 feet, the tanker crew spotted a truck in the overrun. The aircraft went around and the incident prompted an investigation by Safety and the Squadron commander. Seems there was a condition of low viz and even lower communications level between the tower and various vehicles operating on or near the runway. Consequently, some changes were made which should be of interest to those who use/run our air patches. All radio-equipped vehicles will use different numbers and different call sign prefixes; flight line driver training procedures have been reviewed; all drivers have been made aware of the importance of communication between them and the tower; tower procedures for vehicle control have been examined; tower personnel are briefed to be alert for any sign of confusion between them and vehicle operators. Now is as good a time as any for each base to make a self-examination re this subject. For more on this subject with different circumstances, see the following item.

TALK TO ME

With a helicopter on PAR final and a C-130 making touch and go's in a VFR pattern, the tower controller cleared the Herk for a touch and go and issued traffic at 10 o'clock. The chopper pilot, spotting the '130 moving from his 2 to 1 o'clock positions, broke off his approach and filed a Hazardous Air Traffic Report. Investigation of the circumstances indicated that there was no danger of a collision, that the tower controller had properly cleared the faster C-130 ahead of the helicopter. What he failed to do was pass the word to GCA. This occurred at night when it is difficult to visually assess the distance between aircraft, and the chopper pilot was justifiably nervous. A little communication will always help the operation.

AIRCRAFT DE- & ANTI-ICING

An overseas airline member of FSF (Flight Safety Foundation) has offered the following. Although in this instance "they" refer to DC-9 aircraft, it could apply to others as well.

"The first 'winter day' of this season with adverse wx conditions resulted in two DC-9 incidents. The two aircraft involved, both departing around 1600Z, experienced increasing problems with elevator movement during climb-out. Investigation revealed the elevator movement problems resulted from freezing of wet snow in between stabilizer, elevators, and tabs.

"Although both aircraft had been on the ground for more than four hours, they had not been sprayed. The decision that spraying was not required had been based on the fact that the snow apparently did not stick to the wing surfaces. Tail surfaces weren't inspected.

"However, it had not been realized that a large amount of relatively warm fuel had been tanked which sufficiently warmed the wing surfaces to prevent snow accretion.

"Attention is drawn to the necessity to inspect the tailplane visually when weather conditions require it."—Courtesy *FSF Accident Prevention Bulletin.*

OPS TOPICS

GROUND LOOP

An Aero Club instructor and student were practicing various maneuvers with the next to be a soft field landing and takeoff (on a hard surface runway 50 feet by 3,000 feet). The snow had been cleared but some normal drifting had occurred. This runway had been used by other instructors the same day without incident. Touchdown was normal. During roll-out, power was applied by the student, causing the nose of the aircraft to rise excessively and obstruct the pilots' view of the runway. The aircraft veered left 5 to 10 degrees which was not detected by the instructor pilot. The left landing gear then struck some drifted snow on the left side of the runway and caused the right wing tip and nose gear to strike a snowbank. Instructors of any airplane need to stay ahead of the bird and the student.

WEATHER WORRIES

No matter how sophisticated our weather reporting abilities have become, no matter how well-equipped our aircraft, how well built, no matter how good our crews—nature naturally gets to us now and then. *Like . . .*

An F-15 recovering from a mission was descending and entered IMC at 12,000 feet. Shortly the aircraft encountered 1/2" hail and what the pilot described as severe turbulence. No lightning or other T-storm activity was noticed. Damage was estimated at nearly $50,000.

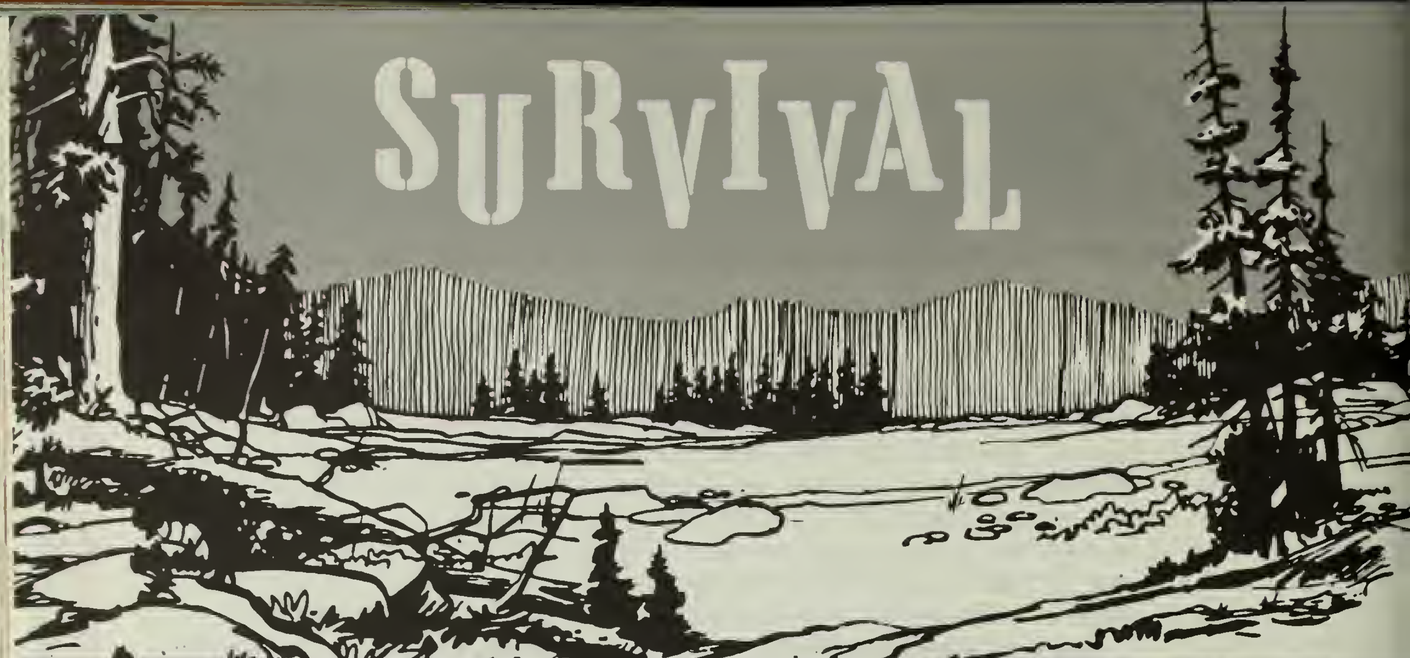
A flight of three cancelled the mission because of weather and began RTB. In thin cirrus at 22,000 feet a lightning bolt similar to St Elmo's fire was observed to strike lead's pitot boom. After landing, they discovered a small hole in the tail cone of each external wing tank. One of the other aircraft had damage to the trailing edge wing tip light lens. No big thing, total damage about $400, but the flight apparently never got closer than 10 miles to any thunderstorm. Remember, those storms have mighty long arms.

HEADS UP MAINTAINERS

While aircrews generally appreciate the good work done by our maintainers, we tend to take them for granted, which is a mistake. Here's an example of sharp action by a couple of maintenance types which the crew certainly won't forget for a long time.

A fuel leak was detected in the tail section of a T-39, but fuel cell specialists could not find a leak; so the write-up was signed off. Next morning MSgt Dewitt D. Bates and TSgt Robert A. Rice were reviewing the 781 and were dissatisfied. They decided to check the leak before the aircraft flew again only to find it had already left the chocks. They immediately called the tower and asked that the aircraft return to the ramp. It did and they found a leaking line coupling in the main fuel line between the main boost pump and engine. This could have been extremely dangerous.

We have many heads up mechs who deserve our respect for the fine work they do. Let's not forget it. ★



THE GREAT ESCAPE

The famous movie, base[d on] the book, **The Great Esc[ape]** depicts allied escapees [mak]ing their way through Nazi [Ger]many by mingling with the [local] peoples, only to be caught by [an]swering to a "Have a nice t[rip]" spoken in English by an en[emy] policeman.

Picture yourself trying to b[lend] with the local populace in, Vietnam, Angola, or Egypt. might have a reasonable chanc[e] look like a Russian, but it take more than disguise to a[void] detection.

All those great Hollywood m[ov]ies a la Hogan's Heroes may [have] deluded you into thinking you fool all of the people all of time. However, in the real w[orld] it's highly unlikely you could anybody long enough to sne[ak] pete out of a hostile countr[y] even if you could speak the la[ng]uage. Your clothes, your sm[ell] your gestures will give you a[way]. Consider the reverse situatio[n] Russian pilot down in the Would his letter-perfect Eng[lish]

n out of place? Could he know idiosyncrasies of our slang-d vocabulary? The **Penkovski** **ers** relate just how much detail ught to Russian Intelligence le concerning American man-sms. For example, they are Americans wear a clean shirt (doesn't everyone), or they how to dial a telephone in JS (could you do that in all of Ma Bell country?). The is that there are so many s we do unconsciously that ake it for granted the rest of world works the same way. I was in Zaire, so many things were done differently what I have known) that I me leery of even pushing an tor button, or turning on the for fear of showing my ig-nce.

successfully evade through nemy populace, you need to all of the customs and man-ns different from your own. familiar thumbs-up hitchhik-esture is now used in Europe. cans use their knife and fork posite hands from other coun-A Turk lifts his head to say and drops it to say "yes." merican shaking his head would really be saying "Yes-es-No." A "come-here" ges-s different. Any one of these s could identify you as a e and never, repeat never, a "hook 'em horns" because ay get a football yell in Tex-it in Europe, you will incur ath of an irate husband. An hman once told me he could tell an American by his de-for ice in his drinks. Let's —Americans are conspicu-hen they're out of their en-nent.

avoid capture, you avoid . People catch people. Your anguage, and manner mark stinctly. Don't be seen and on't get caught. Evade h the woods, hide, move from shadow-to-shadow. Patience. Don't allow temptation to trick you into shortening your trip by min-gling with the people. Patience. Avoid public transportation. It's tough to understand the simple ins-and-outs of riding European trains. I once entered the wrong coach in Germany. Another time, I almost rode the Moscow subway forever because I couldn't read the Cyrillic alphabet on the map.

Changing from a military uni-form to civilian clothes might help you blend in but if you get caught, you are jeopardizing your rights under the Geneva Convention.

Since we're not at war, you probably see very little relevance in all this. With terrorism and kid-napping the order of the day, there are many nations where a "rich" American could be in danger. A friend of mine was shanghaied by bandits in the Middle East. Their motive—only robbery. When the captors discovered they had an American Army colonel, he was held for ransom, and his life be-came threatened. Moral of the story, keep a low profile in foreign countries. You must survive away from people.

Like any survival training, we hope you never use this informa-tion but when escape and evasion time comes, remember—patience pays off. What have you got to lose by taking chances? Ask any PW. ★

CAPTAIN HOWARD R. ALLAN
Training Development Branch
3636th Combat Crew
Training Wing (ATC)
Fairchild AFB WA

"WHAT'S A
TWEET?"

CAPTAIN EUGENE A. ROSE • US Air Force Academy

A six thousand pound dog whistle? Nope. An Air Force aircraft used to train student pilots? Yes. A fighter type aircraft used to train student navigators at Mather Air Force Base? You must be kidding!

The T-37 is alive and well in UNT. Since the conversion to the all-jet navigator training program in the summer of 1975, the T-37 has assumed increased importance in navigator training at Mather. This article will familiarize navigators throughout the Air Force with this new phase of training and briefly describe some of its fundamental elements of instruction.

The T-37 training is conducted by ATC instructor pilots assigned to the 455th Flying Training Squadron. The unit, consisting of nearly 50 instructors, is composed of recent UPT graduates and pilots with previous operational flying experience. At present, this experience covers nearly all Air Force aircraft, except some of the more recent tactical fighters. The squadron provides both academic instruction in Advanced Airmanship and flying training in the T-37.

Advanced Airmanship is the third phase taught in UNT. The academic instruction consists of basic VOR/DME navigational procedures (RMI only), course intercepts, VFR map reading, wind analysis, dead reckoning, use of low altitude charts, approach plates and AFM 51-37 instrument procedures, time control, flight plans, use of FLIP, clea crew coordination, and an intro tion to the T-37 aircraft.

T-37 flying training consist the first five flights in UNT. many students this is the first f in an Air Force aircraft, and casionally the first flight of kind. The flights are care scheduled so that they closely low related classroom instruc and two practice sorties in the simulator. The first two flights VOR/DME airways navigation sions and are generally fl around 15,000 feet MSL. The two rides are essentially VFR reading routes flown at ar 10,000 feet AGL, although an

ance is maintained throughout flight. The fifth and last sortie combined formation and contact e that includes an introduction crobatics and maximum perfor- ce flying. All rides are graded there is no check ride flown e T-37 phase of training.

w that you are familiar with general course, let me discuss of the fundamental elements struction:

ARING

earing is one of the most im- nt jobs that a student naviga- as in the T-37. Not all naviga- vill have a crew position with pability to see outside and but many will. Even those will not have a window can an appreciation for this time ming, difficult, and critical job ually performed by all pilots. it is essential to have every ossible clear at all times when in the Sacramento area as of the general aviation traffic United States is over the great l valley of California. The col- potential is very high and clearing is absolutely neces- Clearing must be done con- sly — with only momentary to perform other duties. as a pilot always refers back attitude indicator as the pri- eference point when flying in ather, all crew members with ility to clear must look out- or other aircraft. The impor- of proper clearing is continu- tressed by all IPs and we try p in mind that Air Force tors are initially taught to y a member of the 455 FTS.

/ COORDINATION AND KLIST USAGE

student navigator is an active gressive crew member who with me to accomplish our mission. We use the "challenge and response" method of checklist usage. The student is the checklist manager and must ensure that all checklists are completed properly. If ever in doubt as to whether I responded properly, the student must ask me again for my response. I never criticize a student for asking a second time. Coordination between the pilot and navigator as to condition of flight, i.e., altitude, airspeed, heading, etc., is stressed with particular attention to altitude calls. The student navigator must advise the pilot approaching all level offs. I point out to my students that the height above touchdown (HAT) for the PAR to runway 22L at Mather is 100 feet. Since the altimeter can have a 75' error, two or three seconds of inattention resulting in a missed altitude call can spell disaster in the weather. From the very first ride, I teach my students to maintain a questioning attitude about everything that takes place in flight. Every aviator makes mistakes and the student should not hesitate to challenge the instructor. There is no such thing as a dumb question when flying—the student should participate as an active member of the crew.

RADIO PROCEDURES

The student is in charge of the navigation and communication radios throughout the flight and must TIM (tune—identify—monitor) the correct VOR and DME frequencies as well as manage the transponder from takeoff to landing. The UHF communications radio is also the student's responsibility, except during the instrument approach phase when I usually make the calls to let the student concentrate on the instrument approach. Brevity and clarity are stressed in this area. With only five T-37 rides, the student must pass his initial "mike fright" and practice on the "real world." Standard Air Force terms are taught but when in doubt, state in plain English what you want to get across. Although a recent call one of my students made, namely "Oakland Center, Colt two zero, level one-three-thousand nine-hundred and seventy-five feet" was a little bit of overkill, I had to give him credit for accuracy.

First five flights by UNT students are in T-37. For some, this is their first flying experience.

WIND ANALYSIS

All flight planning in the T-37 is accomplished "no wind" as the student has not yet been introduced to the hand-held, air navigation computer. Once airborne, we discover that wind significantly affects our aircraft and we attempt to analyze its direction and velocity. Towards the end of the first flight, the student begins to anticipate the effects of the wind when turning to a new course. One technique I teach is that 10 degrees of drift correction is necessary to compensate for a crosswind component equal to 1/6 of your TAS. Since we normally fly our sorties at 240 KTAS, 5 degrees of drift correction results in a 20 knot crosswind component. Using a standard DME groundspeed check, the student can also determine the headwind or tailwind component and then mentally combine these two vector components of the wind. This can be done on the face of the RMI, much as one solves a fix-to-fix. When turning to a new course, the student then applies this same process in reverse and provides a new heading that includes a drift correction angle. Adjustments are made in ETAs based on the new headwind or tailwind components. Using this basic technique, it is not difficult to determine the actual wind at altitude within 10 degrees and 5 knots.

TIME CONTROL

On the first two rides the student never changes airspeed and we always fly at 240 KTAS. Time control then becomes nothing more than determining the actual groundspeed through DME checks and then revising ETAs. The problem is much more complex on the third and fourth rides (map reading) as the student must make airspeed adjustments in order to reach each checkpoint on time. We teach two methods, the incremental and the

10%. Essentially, in the incre
tal changing the airspeed by
will provide a 10 second per m
gain or loss. For the second me
a 10% airspeed change will
in a gain or loss of 6 second
minute. Both of these method
based upon correcting in a no
situation. If the wind cause
off time, which is usually the
then the rate of correction ma
fer, but at least these correctio
the aircraft moving in the
direction — the important f
There is nothing more discour
to me as an IP than having a
dent realize he is 30 seconds b
time, spend 2 minutes figurin
proximate airspeed correction
end up 60 seconds behind. Th
cret to good time control is t
ticipate the winds and chang
speed as soon as a deviation i
ticed. The incremental or
method can then be used an
airspeed further refined as n
sary.

VFR MAP READING

The key here is to go fron
map to the ground—not the
way around. At this time I
duce the student to a new
"assumed position." While lo
at the elapsed time from the
of the map reading route, and
ring to the tick marks on the
the student determines the pr
location, i.e., assumed position
student then projects the flight
on the map, picks out some
visual references such as lakes
ers, airfields, bridges, moun
towns, etc. The student then
for the selected landmarks o
ground. As soon as the landm
are located, the student shoul
to confirm them with at leas
more visual reference, and the
the landmarks to analyze track
time. I encourage the student to
the next turn point as early as
sible. If it is moving neither
nor left in the windscreen, the

udent has the drift killed and is acking to the point. As a bottom ne, if lost, go back to the "big cture," start with something large nd obvious, maybe a city or lake, nd from there determine general ientation. The student can then oceed from the obvious to the less vious and find the exact location. asy to say—but hard to do. The ility to read a terrain chart (we e TPCs) cannot be mastered in o rides, but we do at least provide introduction to the task. VFR ap reading is also an excellent d in for radar interpretation that ll come shortly after completion the T-37 phase.

RIORITIES

This item isn't even on the grade eet but to me it ties together erything that we try to teach in T-37 phase. The student must rn that everything cannot be ne at once. The most important ngs come first, i.e., clear and igate. When time permits, the critical things can be done, such checklists and flight log entries. encourage the student to get ngs done early if possible. Fuel be logged a minute or two be- the turn point by subtracting fuel flow per minute from the l at the time. Control ETAs can computed as early as possible ead of computing them one at a e over a turn point when things all happening at once. The key he art of airmanship is: Keep r wits about you, don't get flus- d, line up your tasks, and get n done one or two at a time. ryone has heard the old adage flying is "hours of boredom ctuated by moments of stark or." Perhaps it overstates the , but the general principle is as today as ever. To help our- es function during those mo- ts of "stark terror" (the busy s), it only makes sense to do early when possible. As an aid to determining priorities, the student is taught to aviate—navigate—communicate, in that order. To do that effectively is the essence of airmanship, and that's what we are teaching in the T-37.

Even though the T-37 has been at Mather for only slightly over 3½ years, several major changes have occurred. Two of the most significant are the introduction of hands-on-training (HOT) and formation on the fifth sortie.

Hands-on-training consists of allowing the student to practice several basic flight maneuvers. Among these maneuvers are: straight and level flight, turns, climbs and descents, and airspeed changes through proper throttle technique. Also, the student is given the opportunity to practice AFM 51-37 unusual altitude recoveries as well as several basic aerobatic maneuvers. The goal of this training is to expose the student to the pilot's duties, thus making the student a well-rounded crew member. The goal is not to develop flying proficiency. Although the student is not graded on hands-on performance, this training provides the student with a greater appreciation of the flying profession.

The formation profile flown on the fifth ride has been in existence for a little over a year. The profile is a two-ship IFR departure to a contact working area over the Sierras near Lake Tahoe. Once established in the area, the two aircraft split up and accomplish selected single-ship maneuvers. Included among these are steep turns, aileron rolls, barrel rolls, loops, cloverleafs, lazy eights, the split S, and recoveries from inverted flight and unusual attitudes. The student may fly the recoveries, as well as some of the acrobatic maneuvers. After this single-ship portion, the formation then rejoins for some wing work and extended maneuvering where the second aircraft flies approximately 500 feet aft of lead. The formation then normally makes an IFR recovery to Mather for a wing landing. This sortie exposes the student to some tactical type flying, develops an appreciation for the concept of mutual support inherent in formation flying, and helps develop the aggressiveness required in a tactical situation. Flight Mission 5 is not merely a demonstration ride. Although the student is not graded on his or her performance of formation duties, the student is graded on all other aspects of the mission. There is no check ride in the T-37 phase, but this is the last ride and the student must put together all that has been learned in the previous four flights and perform accordingly. This exposure to fighter type maneuvering also helps the student determine if a tactical assignment is desired after graduation.

Yes—The Tweets are alive and well at Mather. We are performing an important and unique mission. All of us in the unit are very proud of our role in preparing navigators for today's Air Force. The T-37 phase is still a new and evolving element of UNT, and the members of the 455th Flying Training Squadron look forward with confidence to the challenges of the future.—Courtesy *The Navigator.* ★

ABOUT THE AUTHOR

After Air Force Academy graduation in 1968, Captain Rose obtained a master's degree in Aeronautics and Astronautics from Purdue University. His assignment history includes pilot training, a SEA tour in the OV-1OA, a SAC tour in B-52Ds, an ASTRA assignment at the Pentagon where he also flew the T-39, and T-37 instructor pilot and Flight Commander in the 455th Fly Tng Sq, Mather AFB. He is currently assigned to the Air Force Academy as an instructor in the Aeronautics Department.

Nigh

Nothing seems as effortless or as smooth as the movement of a small jet through calm night air. When everything works right there are no bumps or friction or passing headlights. Just you and solitude.

The takeoff was uneventful, as usual. As soon as we passed the runway departure end, familiar environment ceased. The sky met the horizon and looked like an inky curtain. It had the exact same number of lights as the inky ground. I couldn't tell one from the other. There was no moon.

I thought of Bud McGill who rode an F-4 into the ocean near Okinawa. Same thing. Black sky, black sea. A few stars and a few lights. Everything looked the same. Bud tried to land on a star. Who knows? Maybe he made it.

The gauges read exactly as they should. I sometimes wonder what I'd think if they didn't. Engine smooth, fuel system perfect, easy climb to altitude, comfortable cockpit. We've been living in Star Wars for years. Here are more than half a hundred gauges, dials, and switches, all crammed with numbers and arcs, all telling something about how far you can go, where you have been, how you are controlling the explosion in your engine, how fast, how high, how long. . . . They are all invisible except for the sterile and dull, dim red lights illuminating each gauge. "Too much," I think. I reach down and dim all the lights. I cannot see the altimeter, but my eyes will grow accustomed to the dark.

I wonder when—or if—Bud knew he was a dead man. What did he do in those last life-long seconds? Did he curse himself when he realized he was killing himself. Did he curse a friend who left something undone and became his killer? He probably didn't even know what happ

I hope not.

Delgado was giving his pre briefing on ejection seats. It mostly rates. Numbers. "The USAF ejection was in A 1949," he said—"from an F-8

Nice airplane. I always w to fly one. It seems that I along twenty years too late. really did some flying in the '30s through the late '50s. weren't any rules, little or no no IFR, no PCA, no "help." you and your Jug or Mustang Sabre Jet—and a sky full of rades carrying out a war. It occurred to me that I might flown bombers or cargo craft —that's out of the question. recognized talent back then. enjoy hearing an occasional co talk about the F-86s and F- Some even flew P-47s or P-51s boss has checked out in 26 figh

light

MAJ WAYNE E. GRIFFITH
HQ ADCOM/SEOD

baer

y be the last of a breed that

ce then we have had 4,330 jections."

too impressive. 4,330 USAF ns in, let's see . . . almost rs.

, on the other hand, that's onths minus 12 and 5, 17. nonths. That divided into comes out to . . . more than uld think. Almost 13 ejec- per month for the last 30 I wonder what the Navy, and Marine Corps have How many guys were never ard from? It must be up to o ejections per month.

they had so many more s back 30 years ago and that less when most of our losses d. Good thing, too, seeing e of machinery escalate so lly with each succeeding on.

"In the last ten years, we've had 1,188 ejections."

Well, okay, 120 months divided into 1,188 cases. That sounds better; less than ten. That's 9 point something. 120 into 1,080 is . . . 9. Okay, 9.9 ejections per month. Jeez!

We're going into the murk. Cirrus. I always like to look down at city lights at night and wonder what the town is like. The people and their businesses, lovers looking for solitude. Some people retiring from the day, and others just beginning it. I subconsciously check airspeed, rpm, heading, and attitude indicator. Make sure it all agrees before I get into the weather. I'm not as good at instruments as I used to be, but I don't get to fly much any more. I still like to look outside when I fly, but spend more and more time under the bag working because I need it. Pitot heat rechecked on. Yeah, we're okay. We're ready for some gauge work.

When I was a new first lieutenant, I was flying a night low-level in a much finer airplane. There was an overcast and thunderstorms. I was VFR. Rising terrain kept moving me closer to the clouds. Suddenly and unexpectedly, I was in the clouds and it was R-O-U-G-H! I rolled inverted and pulled and came out upside down and utterly confused. Some little town sat twinkling on the upper right corner of my canopy. VFR again, I went to the gauges, rolled right side up, and relocated the town in the lower left hand corner, and remained confused for another 10 to 15 seconds. Well, maybe I was better then, but I'm smarter now, I hope.

Saskatoon is disappearing under the outreaching fingerlets of some low stratus. There is only a glow in the clouds. And in front is a vel-

vet curtain of dark now masking the stars at 10 o'clock high and moving at me in a rush. I go to the gauges. What's the worst thing that could happen now? Engine quit? I subconsciously finger the fuel toggles. They're in the proper position.

I really wouldn't want to bail out. I trust the system enough, I guess. I think I would be one of those guys who draws his legs up delaying the inevitable for as long as possible. I'd hit my legs or elbows on something on the way out. I remember the kid in north Texas who ejected one night. He didn't have his velcro cuffs cinched tight. A loose cuff caught between the seat and the handle. He came out all right and separated from the seat, except for his right arm. The 300-pound seat whirled around his body breaking his arm and shoulder, then his leg. Finally, the chute opened and forced the seat loose. The guy lived, but it must have hurt like hell. When he landed, unconscious, his compound-fractured leg . . . stuck in a tree stump.

North we go. I can still see a star or two on top through the cirrus, but it's getting thicker. The rotating beacon begins to reflect off the clouds and back into my face. It's distracting. I reach down to turn it off without looking. Switch off. Nope that's not it. Next switch forward. That's not it either. Crap! I should know the system better. Two switches back; yep, that's it.

"I've got ground fire at 10 o'clock and 12 o'clock," I chattered into the mike.

Somebody asked, "What is it?"

"I don't know. Muzzle flashes." They twinkled silver and orange from a very black ridge line, barely discernible. I started a climb and a hard left turn. RHAW gear tuned but quiet. At least it was not radar-directed. Reverse back to the right, check airspeed. Flash, dark, flash. Thump. I've taken a hit, but everything's still working. Hard left and up. Up into the black, half on the gauges, half looking for those killer twinkles. Radio chatter is distracting; everyone is reporting the same thing and asking the same thing, and screeching each other out with simultaneous transmissions. Typical —everybody talking, nobody listening. Whack! Another hit. This time my attitude gyro tumbles but still no "this-time-you-die" lights. I know I'm overcontrolling the airplane, fist white-knuckled around the stick. Some guy is breathing over the UHF. It's me. I turn the cockpit lights up and look for damage. All I can find is a tumbled gyro. I reach for the alternate remote gyro switch. Can't find it. Damn! Lights full up, head down on the right console. There it is. Flick.

"Nuts!" That can't be right. 80 degrees of bank and rolling, 10 degrees nose low and increasing. I look outside and can't see a thing. Lights down. Yep. There are the twinkles on the right middle canopy. Onto the gauges, swallowing my heart. It'll be over soon, and I'll be okay, and act like it was purely routine. Act very calm. Ask who was the timid soul breathing over the radio. I wish they would shoot tracer. They used to, but we pummelled them for it.

It's on the windscreen now. I mutter casually to Deano, "I haven't seen St. Elmo's fire in years." He mutters something back, but I'm lost in the minor miracle of green and silver-green flashes and dances on my windscreen. It's like a mi ture fire fight or a ballet of wi Funny, I never considered the alike before. Somewhere in the b of my head comes Shakespeare:

"All the world's a stage, and the people but actors upon it, st ting and fretting their hour u the stage . . . full of sound fury . . . And then is heard no m

North we go, north, north Saskatoon, out to the ADIZ. Th are no stars now. Only St. E and his little fire dance. I turn for a radial north out of Prince bert. Somewhere just now a fig is scrambling to come out and battle with us. There is a terr orange roar as his afterburner vours air and fuel. He is the p of a spear of fire. And somewh some kid is looking on, wishing were riding on the fire and no Just like I used to do.

We start to break out of clouds. A star here, a light th Suddenly, we are in the clear. Th are a thousand stars and a thous lights. On the left, the north lights shimmer for ten thous miles. They are beautiful. ground is covered with snow. lights of the distant city frees horizon from anonymity. We t back to the south.

"Coronet flight, this is East Radar, descend to flight level o six-zido." Very properly spoken glish. We were ferrying figh across the pond. It always amu me how pilots can understate thing and everything. This was a thing but a pond. A guy gets kil and he "dinged"—or he "bou the farm." Or he "bent an airplan Some guys go tango uniform. Oth drink pea soup. There is "gr

le two-step" and the "leans." ne airplanes go warp 5, others ver. (Didja ever fly formation a tree?") PJs went down on string" to rescue you. Some went feet wet. There were fly-elephone poles, aluminum over-s, automatic bullet launchers, going Winchester. Kinda funny, y. A few facts are sierra hotel. rs are fox uniform.

to the European soup.

Coronet flight, turn right 170 ees, good time, please."

Don't do it, Bill," I interjected. uldn't see his airplane at all, the fuzzy flash of his red wing-ght. "At least do it easy!" Talk the leans. I didn't dare move farther out or I'd be on my That's always been one of the difficult tasks for me, to be on the wing in the soup with ans and have to break out of tion, take spacing, screw my on tight (almost impossible), uges, and figure out where I Not only that, a good wingman to lose his leader, and I'm guys have died for it. I was too close, anyway. But Shep-as a good leader and got us okay. Good thing. We were out of petrol. I was tired from opy suit which was filled with s of sweat. I felt like I earned eer at the bar that night, but ained a private celebration.

pass the city and its neat lines ts. It looks sterile and clean. ely uniform. I know it's not that way, that there's garbage streets, people in jail, and kids down there. But from it is very pretty, like every-s. I glance at fuel and time e that it matches my flight plan perfectly. I can't help but congratulate myself verbally to Deano, but he's caught up in his own thoughts and doesn't answer. No matter, I don't like the noise either. We don't need to talk to feel each other's company. I like that. I roll the airplane up on its left wing and look down at the fairy-tale city. Things are not what they seem, but my vision is as real as the street-walker's down below. We just see things from different points of view.

I rolled it up and looked down at Muang Suey. My thoughts took a romantic back turn into history almost 20 years before. It was from there that the French launched their abortive counteroffensive to relieve the crumbling group of tired heroes at Dien Bien Phu. Just as we were doing now, trying to relieve the siege at Ban Ban. From up here the jungle and karst were lovely. The closer you got, the uglier it became. I was busy looking at terrain when I saw his red beacon much too close. No time for daydreaming at the expense of clearing. You'd think a man could fly over a remote jungle site in Laos without having to worry about running into somebody else.

I see flashing red lights stationary on my canopy. Faker monitor immediately calls, "Chick bearing 150 degrees for 30 miles, Angels 29." Not bad, we've got a visual at 30 miles.

He comes on in and passes off to the port side and begins his reverse for a stern attack. I want to pour the coal to it, yank it up and around and shoot back nose-to-nose, but I can't. It's a 106 and he'd finally beat me anyway since his machine can go up and fast better than mine, but it would be fun to turn with him. Antoine de St. Exupery's "Flight From Arras" comes to mind:

"Fighters are not fighters. They're murderers." "And on the ground, a 20-year-old lieutenant cuts down a stand of 300-year-old oak trees because they obstruct his field of view."

Who are the murderers now? The fighters, the bombers, the missiles? No, they are static for now. The murderers are the highways, the foods, the drugs, the beverages, and people in general. They are not only killing each other, they are killing themselves and their environment. They eat and drink poison. They put poison in their veins. They treat responsibility poisonously and the noxious tidings kill and kill. It kills their children, it destroys the mountains and rivers, and the gentle game, some of whose species are no more. It seems an irony, so many of the killers are unaware of what they are, yet manage to worry about some of the most responsible citizens remaining, the military professionals. To them we are killers. The first ground fire I received was in the mountains east of Ogden—during deer hunting season.

"Rosa 234, you have a chick bearing 360 degrees for four miles, Angels 22." I bank gently and look back over my shoulder and find him tracking us for his kill. What would I do if this were real? It would not be this.

"Rosa 234, this is Rosa Control, confirm you are dead."

I had been home for only a couple of hours after a five-day CTO away from the war. The phone rang. It was Harry Powell. He said, "Roger is dead. Shot down in the 'J'." I was stunned. We had breakfast that morning just before his mission briefing. Later I heard that

he had been pressing; too much time on target, one more pass. His backseater died, too.

I glance at the clock. It's 2346 body time, 0645 zulu. Deano enters it, our deaths, into the log.

He flies it for awhile. We're still almost an hour from landing. A bright red light flickers on. The tip tanks are dry. I sequence the fuel and settle back into thought.

Looking around the cockpit, I find another gadget that I'm not familiar with. That happens a lot. I like to look up under the side panels and around the corners of the cockpit. I frequently find gadgets or signs or stickers that I haven't noticed before.

Once again, I am amazed at how smooth it is. For 450 nautical miles we haven't experienced a single bump. No other ride is so smooth. It all depends on the wind.

I see myself in my sailboat, sails straining in the wind. When I retire I am going to sail around the world, probably alone, although I would like Elston or Hoffmann, or both, to come along. I want to put in up around Cape Cod, or farther north in Maine. Sail the North Atlantic up around Scotland and down by the Cliffs of Dover. I'll zig over to Normandy then down to Spain. I'll work my way down the west coast of Africa around the Cape of Good Hope. Up the east coast of Africa and through the Suez Canal.

I'll stop in Israel, and the Bosporous. Then over to Greece, Crete, and Italy. From there I'll sail to Egypt, up the Nile a pace—up near the Aswan Dam—and back out through the Suez into the Indian Ocean. Around the horn of India. I'll go as far north as Ceylon. Into the Pacific. I am going to do the South Pacific tour, the islands. Timor, Philippines, Guam, New Guinea, New Zealand, and Australia. Up to Hawaii or maybe down to the Antarctic and up. I'll hit the southern tip of the Baja at about LaPaz and down the west coast of South America around Tierra del Fuego. I want to see the Galapagos first, then up to Sao Paulo and Rio de Janeiro. On around the lip to the mouth of the Amazon.

I'll sail 1,500 miles or so up the Amazon's east bank to the Orinoco River, then back out the west bank. Northwest to Vera Cruz, then northeast in the Gulf of Mexico to the Keys. West and north to Tyndall, where I'll meet an old girlfriend and over to New Orleans. Then up the Mississippi to about Vicksburg, back down and out to Houston, where my little ranch is going to be waiting. I have a thing for rivers. I'll sail a piece up all the great ones, the Thames, the Zambezi, the Ganges, the Brahmaputra, the Mekong, and others.

Far away places with strange sounding names. Samuel Taylor Coleridge comes to mind:

"About, about in reel and rout
The death-fires danced at night;
The water, like a witch's oils,
Burnt green, and blue, and white"
and
"The moving moon went up the sky
And nowhere did abide;
Softly she was going up
And a star or two beside"

Why do I want this freedom? I don't know. It is the reason I fly. It is the reason that I live as I do. Unattached, unwilling to include another person. I miss a family, sometimes. I used to think the greatest gift I could give a woman would be to take her in my airplane show her the airman's world. her the mountains and oceans the sky. Straight up; inverted.

We're approaching the target In a little while we'll be descen It's clear and very dark outside cept for the city passing off the fuselage. Poor dummies are asleep readying for labor in morning. It is 0100 and I, too beginning to feel tired. I remem the nights when the club would open for the night flyers. They do it any more. In fact, it is ha find an airbase that welcomes sients at all any more. I think a part of our heritage died when stopped welcoming ALL air and before ingrate radars bega dictate, and when flying was en to keep the young guys in. In a flyer is not welcome in most in flying clothes any more.

I pitch hard left and look thr the top of the canopy at Au Borealis once again. No one pe in 10,000 on this earth has that. Fewer, even, appreciate it I do. Maybe after the world sa tour, I'll settle down with a 8-to-5 routine and start a fa

Down we go, now. From 80 away I see the aerodrome. We'r long final for GCA. The appr controller hands us off to GCA controller. His first instructio "Rosa 234, say your altimeter ting." Now that is a good Deano answers, and the contr responds, "Your altimeter is rect." He brings us down final a real professional. A half mile I take the airplane and land it.

As we taxi in I open the ca and feel the cold blast of air my skin. It is refreshing. The is alive and exciting. I do not k why. It has been a routine flight.—Reprinted from *Interce* magazine. ★

CHECKLISTS AND CHOW-BOXES

OHN R. ODOM, III
Guard Air Station • Elizabeth City, NC

ost of the following article is written in Odomese as opposed to Coast Guardese. reading Odomese you place your tongue firmly t one cheek. Cheek selec- at your option but the se- should be made carefully. orrect decision and a mis- tongue can sometimes lead avations. In essence that this article is all about.

e has been a great deal of ound the C-130 community rs concerning the correct ology for those big black able rollers. Ever since an ce major said "Cheer up, ," and the landing appara- raised on the takeoff run, "gear" has been as ver- s George Carlin's "seven rds." History seems as s the people who make it. ppose that the term for the ad been "wheels" and amous major had said n't you put your heels up x, Charlie?" Where would w? The much maligned ear" would probably be as s the term "wheels." Gear /wheels—heels; the real problem is not so much terminology as just plain professional cockpit communications.

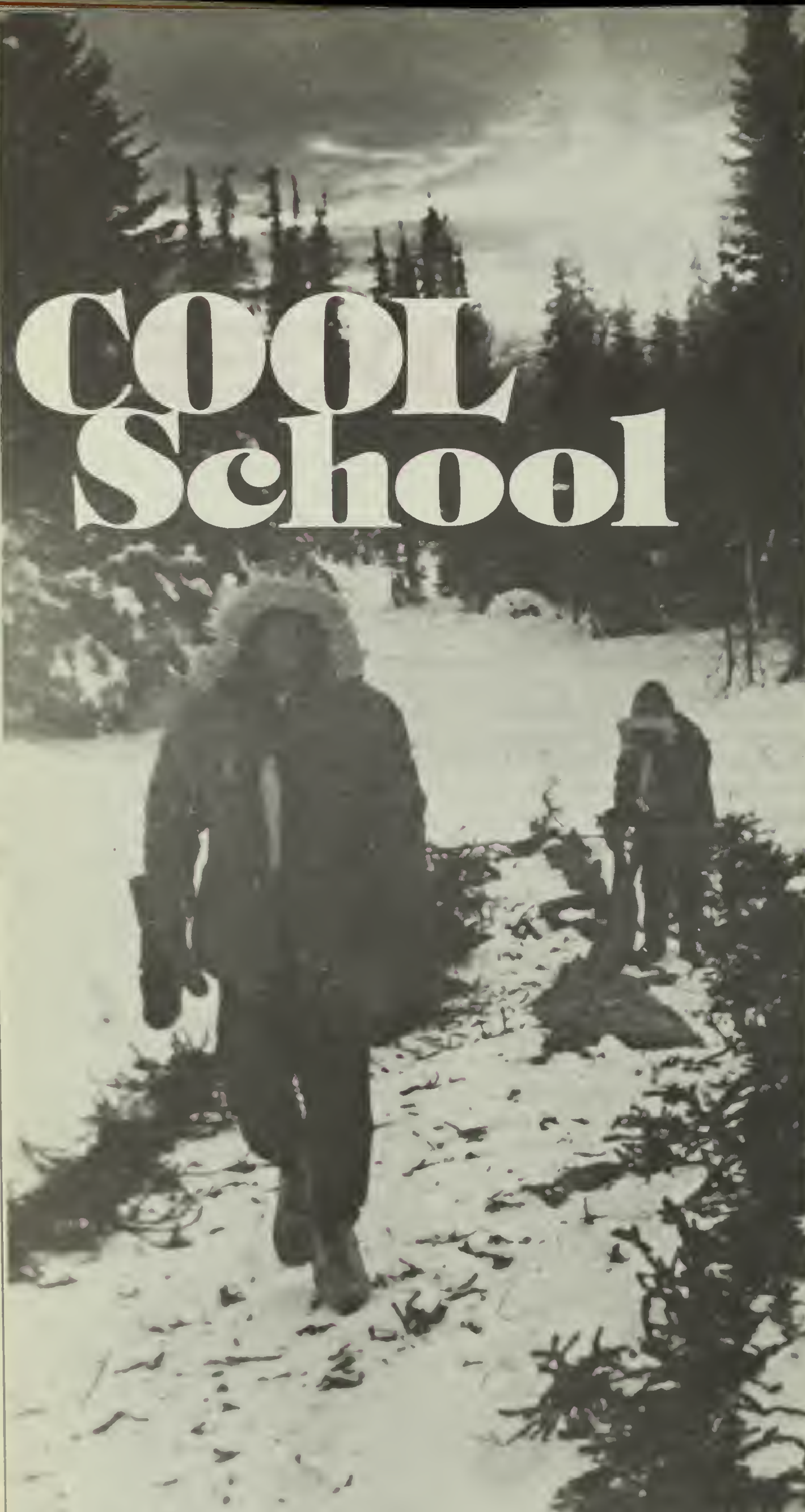
As military people we dearly love the art of taking unbelievably long titles and shortening them into neat little many syllable words. The acid test for "having arrived" is knowing what these tongue twisters actually mean. This situation is just fine for the staff officer, but it has no place in the art of flying.

The C-130 community, that same community where you never mention the term "gear," except in the privacy of your bedroom, now has a new source of communications irritation. We actually have pilots asking for a BLP, which sounds strangely similar to BLT. The frustration that a new scanner must go through rummaging through the chow-box looking for the bacon and pastrámi (we always have the lettuce) is needless. There we sit in the front, standing by for a response from the scanner on "The Before Landing Pattern Checklist" and he is madly tearing through the chow-box.

Charlie is happy and well-adjusted these days; he hasn't had a problem with the rollers in years. The scanners on the other hand, are getting old at 20 and now most have police records since their paranoia for chow-boxes has manifested itself into physical harm for Coast Guard cooks. Please save the scanners and the cooks and either order pastrami and bacon as supplements to your ration components or call for the "Before Landing Pattern Checklist."

You can take your tongue out of your cheek now. I am certain that you can detect my decided dislike for dry, technical verbage. I now must regress, however, into the serious.

Checklists are provided to us professionals by professionals for a number of reasons. They can assist in keeping all of us out of difficulties only if they are used with as much absolute exactness as we can muster. Checklists, like any other tool, are of great benefit if properly used, but like the misplaced hammer—if improperly used they can inflict a lot of needless aggravation. ★



Story and Photos By
SSGT ROBERT S. THOM
Det 5, 1369th Audio Visu

Each year, more than 50
tary and civilian person
ceive what they will aff
ately call their "Cool School'
ficates. These individuals wi
attended the Arctic Survival
at Eielson Air Force Base
Fairbanks, Alaska.

Though located at an A
Air Command (AAC) bas
school is run by Air Training
mand instructors of Detachn
3636th Combat Training Wir
school strives to indoctrina
train people in survival tech
needed under emergency con
in the Arctic or in arctic-like
tions. Air Force personnel
Alaskan Air Command and
duals from other Air Force
attend the course, and, the
studies are open to other g
ment agencies such as the I
of Land Management, the N
Marine Fisheries Service, US
Service, and the Alaskan
Troopers.

The first organized cool
was set up during the winter o
at Nome, Alaska. Three year
for economic reasons, it was
to Ladd AFB, near Fairbank
years later the base was turne
to the Army and all Air
operations—including the sc
were moved 21 miles so
Eielson.

The school's academic sta
set up courses of study tha
students a better understand
the natural resources and to
them how to use these resou
their advantage. The schoo
weekly courses each year fro
November through March.
those months, the weather
tions may vary from −20 to
degrees, and as one instructo
"The colder it is in the fiel
more realistic the training er
ment for the students."

Day one (Tuesday) of the

the first half of the second day, spent in the classroom. There students follow courses designed ientally and physically prepare for the possibility of a survival ode in the Arctic. In the class-, the men and women learn to react to unattended injuries; onged exposure (also how that lead to shock, hypothermia and bite); and how lack of water es dehydration even where there normous frozen water resourc-)ther classroom lectures teach procedures for coping with, how to build shelters and to enhance the chances of re-y by knowing the mechanics of h and rescue.

r the noon meal of that second most students—having heard e grapevine what the next two hold for them—eat extra help-of everything. After lunch, in-ors and students load their aboard military buses for the the field training area. There, are divided into small groups moving off into the bush.

ch individual carries a 50 M-1 bag packed with heavy, down-filled pants, two sleeping bags, a saw-shovel, and two cans of flight rations (the latter is the extent of their food for 50-some hours). The students and instructors hike until they come to training areas that have been set up with common-use shelters and pits for building fires.

Within minutes of their arrival, each instructor has students in his group digging into their individual survival gear for saws to cut firewood (the students search for dead wood rather than cut living trees). When the fire is started, two students will shovel snow into a section of parachute material, bind the edges together, and hang it from a pole so as to be directly over the fire. The snow melts into a can underneath, providing water for coffee and soup.

Later, the students huddle around the fire, drinking coffee, as the instructor stresses the point of drinking large amounts of liquids to prevent dehydration. The instructor also lectures, in detail, on the use of signaling devices to attract the attention of rescue crews searching for downed survivors of an aircraft accident, or other persons in an

tudents warm by fire while instructor lectures. Right, top to bottom, student builds shelter; Linda Glenboski, research biologist was only woman in class; using te material for shelter.

Captain Alan K. Lambert, 18 TFS, Elmendorf, Alaska, and Mr. David C. Flannagan, National Marine Fisheries Service, Kodiak, Alaska, eat their individual flight rations. Sergeant Roger Hinz starting fire.

emergency situation. Under the guidance of the instructor, the students learn to use jet flares, "gyrojets" and other signaling equipment.

Finished for the day, the instructors depart, leaving the students to face alone their first night in the field. The tired students head for their sleeping bags in the common-use shelter, a small hut built into the ground and covered with tree branches, parachute material, and several feet of packed snow. Normally, 12 students will squirm into their sleep-bags in these purposely-cramped quarters. Through the night the body heat from all of the students will raise the temperature in the hut by some 20 to 30 degrees.

Early Thursday morning, the instructor conducts a short session on the building of one-man shelters. Following that, the class starts a full day of working on their individual shelters—which they will sleep in that evening. Master Sergeant Peter Kummerfeldt, instructor, comments, "Lots of time is given to the students to build their own shelters because this is an important factor in survival against an arctic environment. If an individual can recover from the shock of finding himself in an emergency situation, and can quickly recover to build a shelter, his chances of survival are much better."

After their second night in the field, the students and instructors set up several signaling devices in an open field. Devices of this type are made of an old parachute and a large fire, and are used to signal searching aircraft.

Later that morning, each student uses a radio to signal to an aircraft circling overhead (the aircraft is simulating a search and rescue mission).

As noon approaches, everyone returns to camp to tear down their individual shelters, clean u training area, and then walk to the road for the bus ride to Eielson.

Back at the base, another will be spent in the classroom ing which they will receive completion certificates.

Each student may now feel tle more confident that, shou or she be involved in a "hot" tion while in an arctic en ment, the experience gained "cool school" may be the de factor for survival. ★

Staff Sergeant Robert S. T son is a photo-journalist wit tachment 5, 1369th Audio Squadron (1369AVS/DOC-I Elmendorf AFB, Alaska. M Sergeant Jack Conner who this article is an information nician with the Office of Inf tion, Alaskan Air Command at Elmendorf AFB, near An age.—Ed.

PILOT IN COMMAND

LT COL CHARLES L. POCOCK, JR. • Directorate of Aerospace Safety

ot responsibility is defined, pelled out, specified or implied in almost every Air Force directive.

nition and limits of pilot au-, on the other hand, are not to grasp. In general terms, signated pilot in command is ely responsible for the safe accomplishment.

, a lot of people have con-g responsibilities. The main-officer's signature on the 781 acknowledges his re-ility to provide an airworthy An IFR clearance signifies esponsibility to provide sepa-rom other IFR traffic. But, ose gear won't come down, ot in command is still re-le for the safety of the air-nd all people on board. By e token, if an aircraft is fly-ng at the proper assigned nd altitude and another air-nts to occupy the same air-t is the pilot's responsibility evasive action.

e does the authority to carry responsibility come from? , it has evolved from Mari-. More specifically, the au-o deviate from established rules is contained in those rules. For example, AFR 60-16 contains authority to deviate from AFR 60-16 when an emergency or unusual circumstance occurs. It also states that the designated pilot in command, commands all persons on board and all aircraft in the flight, regardless of rank.

During the public hearings into a recent airline accident, involving flight into severe weather, several airline captains flying in the same vicinity were questioned. These pilots had deviated around the storm that caused the accident. A key question they were asked was: "Without knowledge of the accident but with the picture you saw on your radar scope, what would you have done if ATC had denied your deviation request?" Each captain replied, in about the same words, that they would have exercised their emergency authority as captain and deviated around the storm, regardless of ATC clearance. There was no question in their minds about their responsibility or their authority.

A hundred years ago a military commander was given a mission and the resources to accomplish it and sent off. When he returned he turned in his "trip report" and log. Little else was mentioned, particularly if the mission was successful. He had the responsibility to accomplish the mission as he perceived it, and almost unlimited authority.

Today, through the miracle of electronics, no military commander is more than a few minutes away from some higher authority. This world-wide communication system gives much better command and control and resource management, but is perceived by some as being a tie to mother's apron strings—having responsibility for mission accomplishment but no authority. This is a mistaken perception since there can be no responsibility without authority.

It is much easier to sit up in a tree and tell the man on the ground how to fight the bear than get down on the ground and fight the bear yourself. Once again, a matter of perception. The astute aircraft commander uses the communication system to fight his bear rather than let it use him.

The guy in the command post is human; he likes things to go smoothly and dislikes things that

make waves. He would much rather hear: "CP, this is Air Force 12345, destination, ABC Base, is below minimums with no improvement expected for two hours. I'm diverting to XYZ base at this time. Expected landing time is 0000 hours. I'll call you when I'm on the ground," than for the radio to say: "CP this is AIR FORCE 12345, my destination is ABC Base and the weather is not too pure, what do you want me to do?" Obviously, the latter is going to make waves in the otherwise tranquil command post routine, and any controller worth his salt is going to counter that question with another question, or several such as: "What's the ABC forecast?" "What's your fuel state?" "What's your alternate?" "What's the weather at XYZ", etc., etc. It would be much easier to just say "Roger." The aircraft commander would have made the decision and the controller would have been happy. Of course, if the controller did not like the decision, he could have made his own waves and this would require some effort and possibly your concurrence and the DO's coordination.

Complaints often heard (over at least the last 20 years) are: "Why can't maintenance fix the airplanes?", or "The only thing they care about is on-time departures", or "How come they want me to take a broken airplane?" Remember, if you let someone else talk you into an unsafe airplane that's your fault.

I don't ever hope to beat a maintenance man at his job. I understand his problems, and while I may empathize with his problems I also know we each may represent adversary positions. His job is to get the aircraft airborne. Mine is to get it back on the ground. No one expects a pilot to know what is in all the maintenance tech orders, regulations and manuals. What is expected of pilots is that they know what is in the Dash One, and all the flying regulations and manuals, particularly the mission requirements, minimum equipment list. And they are expected to exercise sound judgment in relating the aircraft condition to mission requirements.

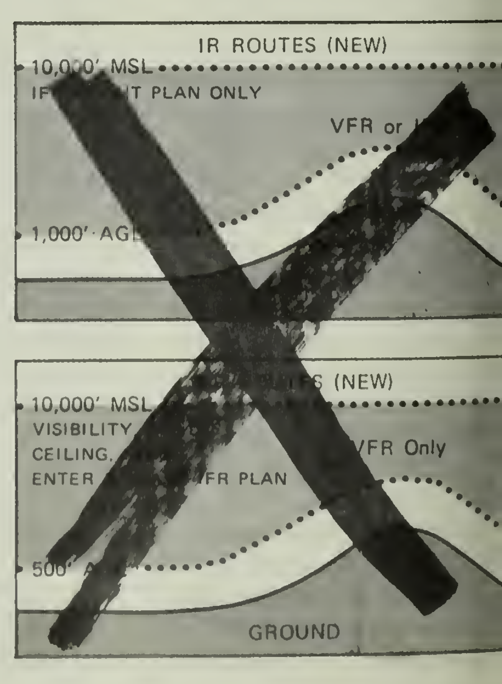
Flying a local transition mission with a tire worn to the first cord layer, or taking off with an inoperative radar to a destination forecasting thunderstorms, or taking off on a gunnery mission with an inoperative gunsight simply reflect poor judgment. Sure, you may take some verbal gas but no one said flying was *all* fun. On the other hand, turning down a morning local for an inoperative landing light, or a ferry flight to the depot with an inoperative gunsight, or a day VFR ACM mission with an inoperative ILS reflects equally poor judgment.

The pilot has the ultimate responsibility for the safety of the mi
He has, and must exercise, th
thority to carry out that resp
bility. And accountability fo
decisions must follow. Do wh
is necessary to accomplish th
sion safely and be willing to d
your position. Just because
commander asks why you m
decision doesn't mean he is cr
ing you. Most of our flying r
tions and manuals are writt
blood. They should never be
as a crutch or substitute for
judgment. Most important —
can be legally violated to prote
or property when a pilot
necessary.

"Regulations are directive
uninformed and guidance fo
informed." "It doesn't requ
highly codified body of regul
and directives for an intelligen
to exercise good judgment."
first quote is by an RAF Air
modore and the latter by a f
CINCSAC. ★

CORRECTION

In the article "Sharing the Air with Military Jets", **Aerospace Safety,** May 1978, charts depicting the new IR and VR routes indicated a floor of 1,000' AGL for IR routes and 500' AGL for VR routes. Actually, military flights may operate at any level from the surface up.



A FOD Prevention Program That Works

LIEUTENANT COMMANDER DAVID J. CAREY
NAS Miramar
San Diego, California

The Air Force has been working hard at FOD prevention but we still have several occurrences daily. We are not alone; other services have the same problem. Here's what one Navy unit has been doing about it.

you're FODDING engines er than you can build them; you're flying less (and en- it less) because you suffer bare firewalls; if—you're ng FODDED engines more njoying it less—then what eed is a FOD PREVENTION RAM THAT WORKS! FOD tion—a traditional apple d motherhood item—that It may sound like a dichot- out COMFITAEWWINGPAC* arked on an aggressive pre- program—and it is work-

From July-September 1977, the COMFITAEWWINGPAC community suffered 42 FODDED engines with major damage, 35 of those were TF30 engines from the F-14. (The TF30 engine is particularly susceptible to FOD due to the location of the intakes and the large volume and high velocity of intake air). In that quarter the wing averaged 24 bare TF30 firewalls a week. In the third quarter of FY 78, there were 29 major FODs, of which 22 were TF30s, with an average of five bare TF30 firewalls a week. The number of major FODs (all types) aboard NAS Miramar has gone from 20 during the first quarter of FY 78 to nine during the third quarter of FY 78. A noticeable improvement, which has been produced in large measure through local FOD prevention efforts.

Recognizing the FOD rate as unacceptable in autumn 1977, the Wing Commander, RADM F. G. Fellowes, made the decision to

*COMMANDER FIGHTER AIRBORNE EARLY WARNING WING, US PACIFIC FLEET

A **FOD** Prevention Program That Works

continued

Scrubber & Roamer Vacuum Sweepers for inside/outside hangar cleaning.

launch a massive FOD prevention effort. He announced his complete dedication to reducing the FOD rate and directed all units to critically review their FOD Prevention Programs. A former squadron commanding officer was then appointed as the Wing FOD Prevention Officer, a billet formerly the collateral duty of a LTJG. The FOD Prevention Officer was given department head status, with attendant authority, and reported to the Wing Commander daily. Each unit in the Wing was tasked to provide one innovative FOD prevention idea. Meetings were held with commander carrier airgroups (CAGs) and commanding officers to screen and analyze the inputs. Those ideas which were of merit were assigned to a command for study and evaluation. The products of this process became the elements of the present program.

In November, as the program began to take shape, a two-fold goal was identified: (1) dry up sources of FOD, (2) improve, change, or eliminate procedures that have potential for causing FOD. Ground operations at Miramar were tailored so as to be as "FOD preventive" as possible without disproportionately ham-stringing operations.

a. Section taxi was not authorized (except A-4s).

b. Minimum taxi interval was set at 1,000 feet.

c. Taxi power was to be absolute minimum required.

d. For flight take-offs:

(1) Encouraged use of maximum runway interval.

(2) Encouraged use of both parallel runways for flights of t or more aircraft.

e. A review of ramp layout taxi procedures was undertake

f. Duct walkers were to bunny suits and use non-expl flashlights (both supplied by Wing) for duct inspections.

g. Required quality assur representatives and collateral inspectors to:

(1) Inventory tool boxe

(2) Check area for FOD

(3) Observe panel ins tion.

(4) Down aircraft wher explained missing fasten screws were found forward takes.

h. Observe strict complia with maintenance require cards (MRCs) for complete c liness of Ground Support e ment (GSE).

Submit squadron FOD direc- for wing reviews.

that time there were three sweepers (vintage '61 and and three billy-goats (small ble vacuum sweepers) aboard nar. Subsequently the sched- or replacement of the R/W ers has been accelerated. e roamers (billy-goat type ers) have been purchased, ng two per hangar. Three industrial sweepers with ber attachments have been ed and are being modified e both inside and outside angars. Monthly squadron Prevention Officers' confer- were instituted, chaired by ng FOD Prevention Officer, active update on progress interchange of ideas and als.

ands FOD walkdowns of the ramp, taxiway, and runway became a regular evolution. re held once every 6 weeks weather conditions might i.e., after a heavy rain-

xi interval of 500 feet and c flow pattern was man- or the octagonal refueling

xpanded bin (PEB) mate- removed from individual nters and centralized un- cognizance of material Monitoring procedures be developed to eliminate mulation of such material centers and to allow close ng for items used.

leanliness of vehicles and ving access to the line ecame the next target of ram in December, 1977. were inspected for FOD sue and return to AIMD, ueling stations; and at ac- es to the line area with ation reports requiring a

Tennant 240 Power Sweeper, one of Miramar's weapons in war on FOD.

response to the Wing as the pen- alty for non-FOD free vehicles. Littered vehicles were turned away from the gates, and violation re- ports were issued. It didn't take long for everyone to get the word, and at present vehicles in the line areas are remarkably FOD free.

NAS was directed to sweep the **hold short** area twice daily and the FINAL Inspection Team was di- rected to down aircraft with miss- ing or ill-fitting fasteners which were not clearly marked prior to taxi as satisfactory for flight by the squadron.

Early in the game the "bible," OPNAVINST 4790.2A, was con- sidered to be deficient in its treat- ment of FOD definitions and cri- teria. As progress became evident, closer reporting and tracking of FODDED engines became neces- sary in an attempt to identify cause factors and to eliminate them. First, the definition of FOD itself needed clarification. Criteria were established for major and mi-

nor FOD damage. This local definition of FOD was adopted:

> **"FOD is damage caused by an object alien to an engine or aircraft which is either ingested or or lodged in a mechanism which will render the system/equipment unusable or unsafe for operation. Damage caused by material failure of a component which is an integral part of an engine is not considered FOD."**

Of note is that damage caused by some natural hazards (example: bird or ice ingestions, etc.,) is considered FOD. Major engine FOD is defined as damage beyond the "O" level capability and requiring more than 75 manhours at the "I" level to repair. Conversely minor engine FOD is defined as damage which can be repaired in less than 75 manhours at the "I" level. At present, revisions of this definition and the criteria for a Major Minor FOD are being considered. An attempt is being made to more closely align the definition criteria within AIRPAC AIRLANT (Naval Air Forces Pacific Atlantic) and the USAF for standardization of definition and commonality of reporting criteria without degrading the impact of the present local system. Thus, reporting for accounting purposes throughout the Wing was standardized. An immediate report by telephone (message if deployed) is required upon the discovery of FOD damage. It is to include, among other items, circumstances of discovery, cause and classification (major or minor).

The FOD Prevention effort now had the ability to closely track all units, including those which are deployed. Thorough investigation was directed in order to discover causes of FOD, and hopefully, once identified, to be able to eliminate them. The Wing established a FOD Reaction Team to assist squadrons in this investigation. Miramar-based units are to impound an aircraft until a thorough investigation is completed. Non-Miramar based units are to use all available expertise to investigate each FOD incident.

In March 1978, all non-GSE was removed from around temporary buildings on the ramps. For several hangars specific GSE areas were designated. Nine temporary buildings were removed from the areas adjacent to the ramps.

To minimize the FOD potential for units on detachment to the National Parachute Test Range, El Centro, California, some unique operating procedures were set forth:

- 3,000 feet taxi interval.
- Use only centerline of runways, taxiways.
- No section take-offs.
- One aircraft on runways at a time.
- 4,000 feet landing interval.
- Detachments are to take a Roamer with them.
- FOD walkdowns are conducted prior to each laur

A great deal has been dc date. What has been a plished? The FOD Preventior gram is:

- Producing data for ma ment and analysis of the prc which is now highly reliable
- Aggressive.
- Highly visible.
- Clearly identifiable an fined.

	JUL-SEP 77	OCT-DEC 77	JAN-MAR 78	J
MAJOR FODs	42	31	37 (1)	
MAJOR TF-30 FODs	35	22	25	
TF-30 BARE F/W	24	16	5 (2)	
SAVINGS FOR TF-30 (based on $50,000 per major FOD)		$650,000	$500,000	$7

Note (1) Specific reporting quirements which were mor manding established 31 Jar
Note (2) Reached ZERO bare walls 23 Mar 78.

Resolution of TF-30 bare wall situation, attributed in measure to the FOD preve effort, has unmasked num other not operationally ready ply problems which are being sued.

Will a FOD Prevention Pro work? Unequivocally the answ yes; however, it takes a great of dedicated effort on the pa all hands. There is no easy to reduce the number of FO but there is a way, and more rectly, there are many ways. luck. ★

☆U.S. GOVERNMENT PRINTING OFFICE 789/1

TATES AIR FORCE

Vell Done Award

sented for

ling airmanship

professional

nance during

dous situation

d for a

t contribution

to the

ates Air Force

nt Prevention

rogram.

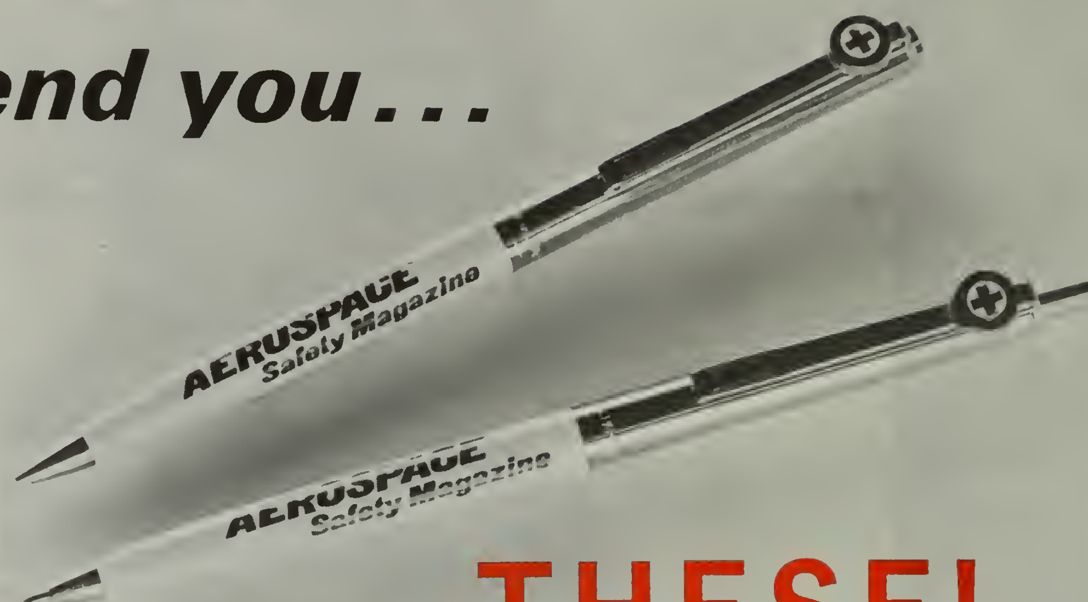
CAPTAIN

Jerry O. Foote

41st Air Refueling Squadron
Griffiss Air Force Base, New York

On 4 March 1977, at Griffiss AFB, New York, Captain Foote was conducting the preflight inspection of a KC-135 aircraft when another KC-135, located across the parking ramp, suddenly burst into flames. Realizing that the burning aircraft would soon be a total loss, Captain Foote's attention was directed toward a KC-135 aircraft parked adjacent to the one which was engulfed in flames. With total disregard for his own safety, Captain Foote rushed across the ramp to the KC-135 that was in obvious jeopardy. As he approached the scene, the intense fire, spontaneous explosions, and accompanying shock waves were nearly unbearable. Captain Foote directed maintenance people to assist him, then climbed into the pilot's seat and prepared the endangered aircraft for engine start. During the engine starting process, fragments from the burning, exploding plane pelted the aircraft. Although Captain Foote realized the obvious threat to his own life and the maintenance people assisting him, he persisted in his efforts to remove the endangered aircraft from the scene. After starting only one of the aircraft's four jet engines, and seeing flames only a few feet from his right wing, Captain Foote released the aircraft's parking brakes and began to taxi with only his left outboard engine running, which rendered the aircraft's nose wheel steering inoperative. Using only the aircraft's wheel brakes to guide its direction, Captain Foote managed to taxi the aircraft through a complete turn and onward to an area where he, his maintenance assistant, and the aircraft were safe. Captain Foote's exceptional alertness, professional skill, and ingenuity possibly prevented the loss of several other aircraft and the lives of other flight line personnel. WELL DONE! ★

We'd like to send you...



THESE!

Earn one of these fine **Aerospace Safety** magazine pen and pencil sets. All you have to do to get one is send us an original manuscript and have it published. If you don't want to sign it, that's okay, too—we'll make it "anymouse." We need to have your name and address though, just for the record. It can be fact or fiction—you send it and we'll consider it. Doublespace, please, about 1,000 to 1,500 words, but if you need to use more or fewer words to say what you want, that's all right! Send your safety message to:

Editor, **Aerospace Safety** magazine
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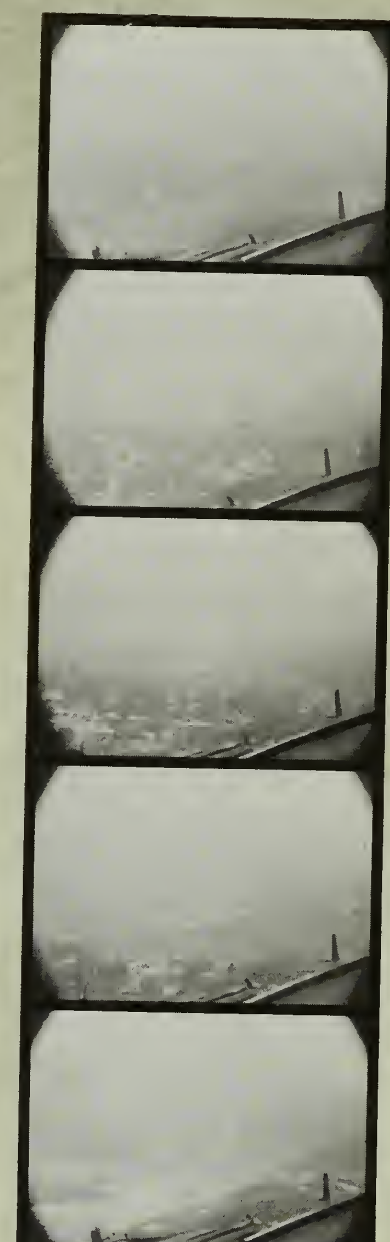
DO IT NOW

aerospace

SAFETY NOVEMBER 1978



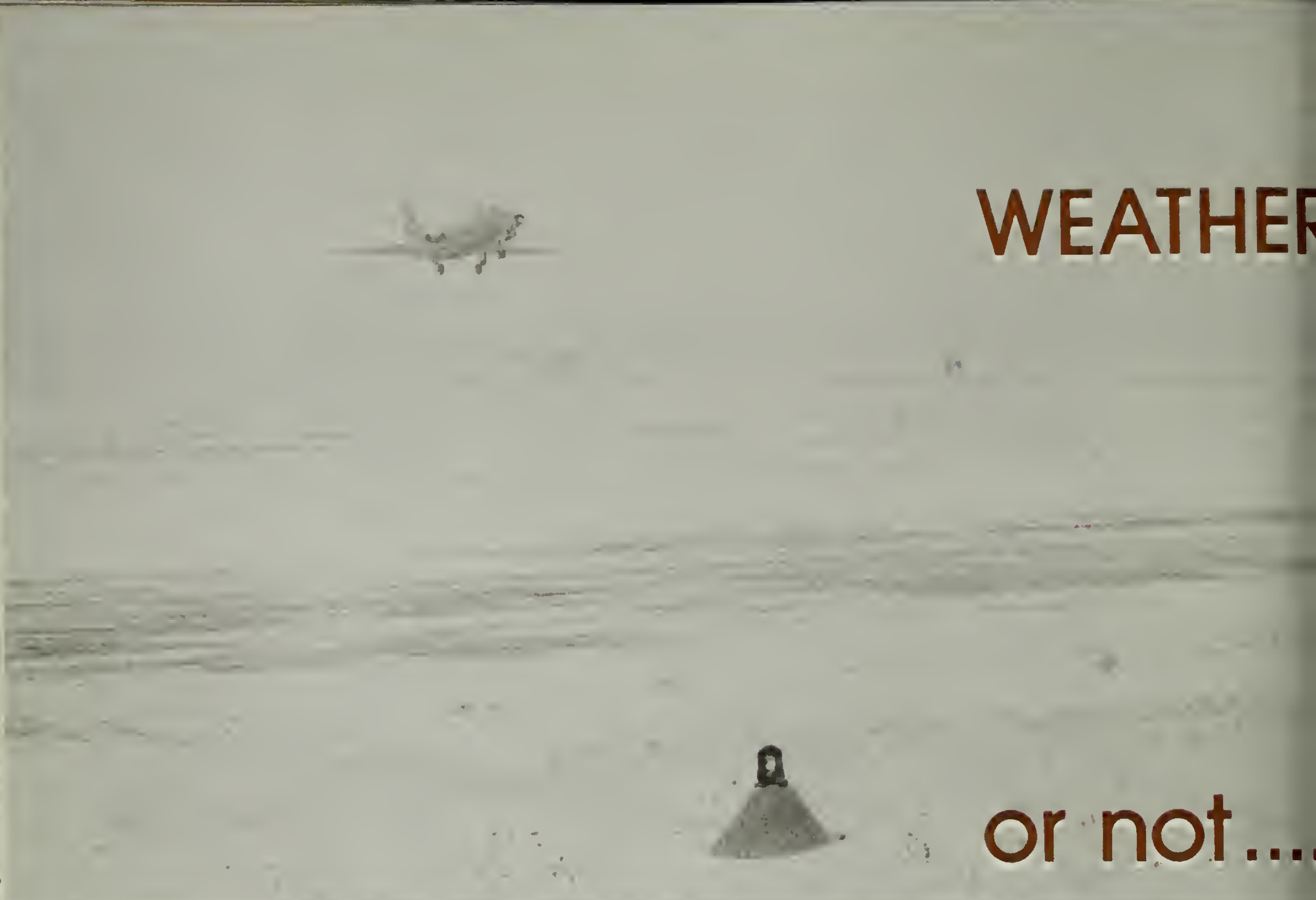
LIGHT ON THE STAR
low well do you really know those lost wingman procedures?

/hen you're up in the air you've got to come down
Veather Or Not

AIRCRAFT ICING
ever underestimate its chilling effects

Sliding Home
ydroplaning season is here

LOSS OF CONSCIOUSNESS
ew research shows pilots can black out completely . . .
. . . and not even realize it.



CAPTAIN DAVID V. FROEHLICH • Directorate of Aerospace Safety

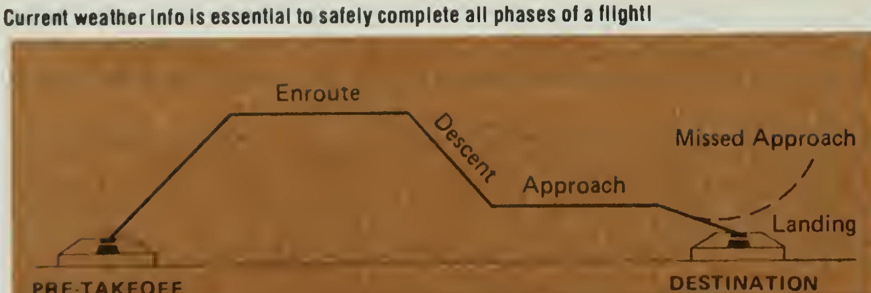
"Slipshod 36 – Podunk AB 1630 Zulu weather is a measured 300 overcast, one and a quarter miles visibility with fog."

This conjurs up different questions, locations and problems to different aviators. That 300 foot overcast may only be several hundred feet thick, or several thousand feet thick, or even layered up to 25,000 feet. Another thought – temperature and freezing level. That overcast is nowhere near as formidable with the freezing level at 12,000 feet above it as the same 300 feet with the freezing level on the ground. That's my point! Heavy into winter as we are now, it's a good time to review some ceiling-busting techniques while sitting comfortably on the ground. For a quick review, I'll divide your weather approach and landing into five phases: pre-takeoff, enroute, descent, approach and transition.

PRE-TAKEOFF

Before you leave base ops or the squadron, get as ready as you c
Take that few extra minutes to st
the approaches, high terrain, obsta
and facilities at destination a
alternate. The word is – prev
surprises! Know the type of ligh
you will be looking for when y
break out; try and have a me
picture of the end-of-runway envi
ment; jot down info you may n
out of the IFR supp. Do anything
the ground that may prevent in
cockpit fumbling in the air. Hav
done both little machine, single op
ator flying and heavy, group ef
aviating, I have to feel that often
fighter-type operator is better p
pared when he leaves the ground.
has to be! There isn't anyone els
search through an L – whatcha
callit for an intersection or juggle
supps and letdown books. I h
caught myself thinking (in my la
cockpit flying days), "*we'll* have t
to look over the approaches and

Current weather info is essential to safely complete all phases of a flight!



t the books on the way." Heavy vers—beware! On the routine trip, t plan may work unless you end up hting engine, electrical, hydraulic other similarly distracting probns. All of a sudden, you may find urself running out of that "time to dy the approach."

Not to belabor the point, but there also a wealth of good info in the viously advertised APQ (airport lification) film strip series that I my first 11 years of flying) never . Only when I became a part-time C teeny weenie airlines pilot did I many of the APQ films on eside bases. These films can be er familiarization tools for any raft operators.

he other pre-departure info that operator should obtain is weather . The pro not only departs with 175-1, but he has read it! Vacuum the weather shop! The basic 175-1 n't tell you everything you may t to know. Get some trend ions from the weather-guesser, questions and have the whole tion firmly entrenched in your tal computer. There is a wealth of ertise and info behind most her counters, but a lot of weather s have been intimidated into ng short briefings and not rializing. Don't find yourself there wishing you were down asking."

OUTE

e weather info problems lead nto some enroute considerations he aircrew. Query the metros the way! Don't wait until the to call your destination metro ty for an update. Calling along route accomplishes several . It may allow you to change ations/alternates while you still extra options. Secondly, you can precisely plan your entrance and of approach by watching trends. y, your calls (with good PS) will help complete the e for the metro folks to pass to ext aviator. ATC, approach controls and towers can also provide some good info on current conditions. Use everything at your disposal.

Spend time (prior to destination) reviewing descent, approach, landing and missed approach procedures with all concerned. The crew concept is of prime importance! The more eyes and minds you have working on the arrival, the better, CAUTION—confusion may be hazardous to your health. When I advocate total crew involvement in approach and landing, I temper that with the fact that every individual must know exactly what his function is. A low ceiling/visibility approach is no place for extraneous questions or interphone chatter! Prevent that type of confusion by thorough pre-flight and enroute briefings.

DESCENT

You have arrived! Somewhere above and approaching your destination, you have made your decision to attempt an approach and landing. That may sound strange and somewhat negative, but I think that frame of reference might be the healthiest!

Just because the field is above published or command minimums, doesn't automatically mean you have to go there. It is still your decision! The decision process should include weather, crew capability, aircraft condition and mission. That's what you get paid for! Weigh the factors and decide!

Like I said, you've decided to go—and you've planned and briefed. What kind of descent? Many folks fly enroute descents to low altitude approaches or vectors. If you have no freezing level problems, that plan may be acceptable. If the icing level is in the soup, a published penetration may get you down through it quicker. That's why a full picture of the cloud tops, bases, thickness, layers and freezing level is critical to your decision process. Your descent and approach decision will include all those factors. It's pretty obvious that you don't want to ask for or accept a descent or approach that will subject you to continued icing or turbulence. By the same token, if you find yourself in those conditions ask for a change. If you don't get a change within a reasonable time, and icing/turbulence is becoming a problem, declare an emergency, squawk and change! Better to explain later than ding one in! Anyway, word to the wise—make sure you've put some forethought into your descent.

APPROACH

We're down rootin' around in the low altitude regime. You can still be in several types of weather environments. Again, the word is mental preparation! I seem to have the most problems with the type of ceiling that sounds the easiest. Take two types of typical destination weather and think about your own experience.

I have flown in the clear for several hours and arrived at destination with an overcast far below me. The deck is reported to be only about 600-800 feet thick with ragged bases near minimums. This is (I think) tougher than arriving in the soup and being in until you break out at minimums. The first case presents a much greater

Better to be down here asking, than up there wishing. . . .

adjustment problem. You have to force yourself to really wire the approach and cross-check prior to the soup, whereas the approach in continuous weather gives you time to settle down in the total IFR environment with no peeking. Not much you can do to change the situation other than being aware of the problem. One suggestion – if time and gas permit and you're stuck with a cloud deck like the ones described above, you might consider changing your normal configuration point, configure early and cut down the number of actions and distractions required while in that cloud layer.

The choice of approach will be dictated not only by the weather and facilities available, but also by personal preference. If you, the driver, feel more comfortable with a precision GCA than an ILS, do it! Use the ILS for a back-up, but choose your own approach, you're the one who has to get the machine down.

At the risk of repetition, if you're in a crew situation, make sure your partner knows the precise division of tasks and functions in the cockpit. There should be no uncertainty going down the glide slope as to what will happen when minimums are reached.

TRANSITION

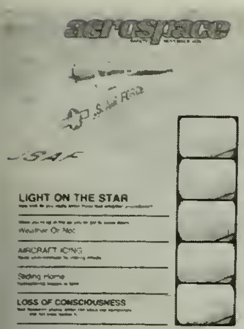
This is the point where you've aced the approach and arrived at the point in time and space where the book says you should be able to look up and see the runway. Most of us know better. Not very often do all of the magic parameters meet at the published point. More often: (1) You'll break out of the actual overcast a few hundred above minimums but have trouble picking out the runway because of reduced visibility; (2) You level off at MDA and look, sight the runway and promptly drive back into the scud; (3) You arrive at minimums, on glide slope, see the end of the strobes and perform the patented but foolhardy "duck-under" maneuver placing yourself in mid-overrun out of airspeed, altitude and ideas all at the same time; (4) You are at the missed approach point, can see the ground below but nothin' but clouds out front and fight the temptation to "press just a little." There are a variety of conditions which can be encountered at the "peek point," most of which can be enticingly deadly. I can only preach two major sermonettes. Decide exactly what your actions will be and (if in a multi-place machine) make absolutely sure the crew coordination is clear.

When you fly by yourself a lot, you have a tendency to develop your own checkpoints! When I was making an approach to a near-minimums airfield, I had a "peek-point" at 100 feet above minimums. At that point I looked up and right back down. If I glimpsed any portion of the runway environment, I knew exactly where to look when I hit minimums 100 feet later. If I glimpsed nothing but "yuk" outside, I was mentally prepared to start the go-around after the next 100 feet. The point to be made is integrity. Approaches, glide slopes, minimums and all the other neat stuff in letdown books are there for a reason. Don't cheat – it ain't worth it!! The odds are against you! Have a plan and stick to the plan when you reach the missed approach point.

RECAP

I've spent a fair amount of time and verbiage discussing only the last 5 or 10 minute period of most flights. Reason – I feel in many cases, the approach is the single most critical phase. Granted, there is high risk in low level routes, on the range or many other regimes, but those phases of flight are very realistically trained for. The operator is dependent on himself and the machine. During the approach and landing phase in marginal weather, the operator is dependent on himself and the aircraft, but also at the mercy of Mother Nature. Be prepared and prevent surprises! It's not healthy to try to fool Mother Nature! ★

The successful end to a weather mission and approach — runway in sight — land!



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NOVEMBER 1978

UNITED STATES AIR FORCE

aerospace SAFETY

THE MISSION - - - - - - SAFELY!

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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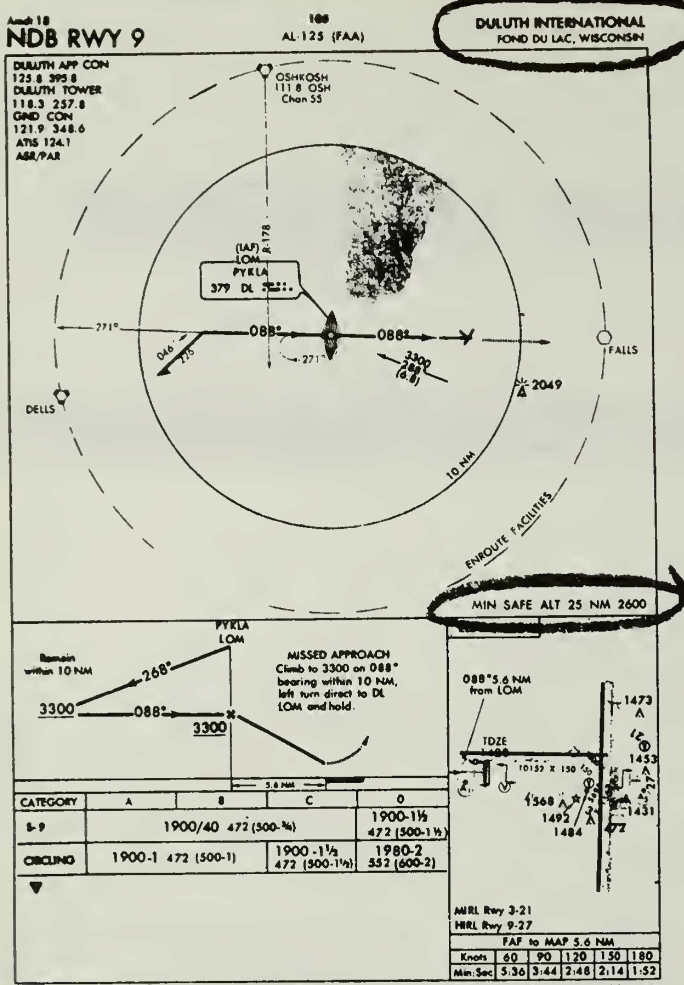
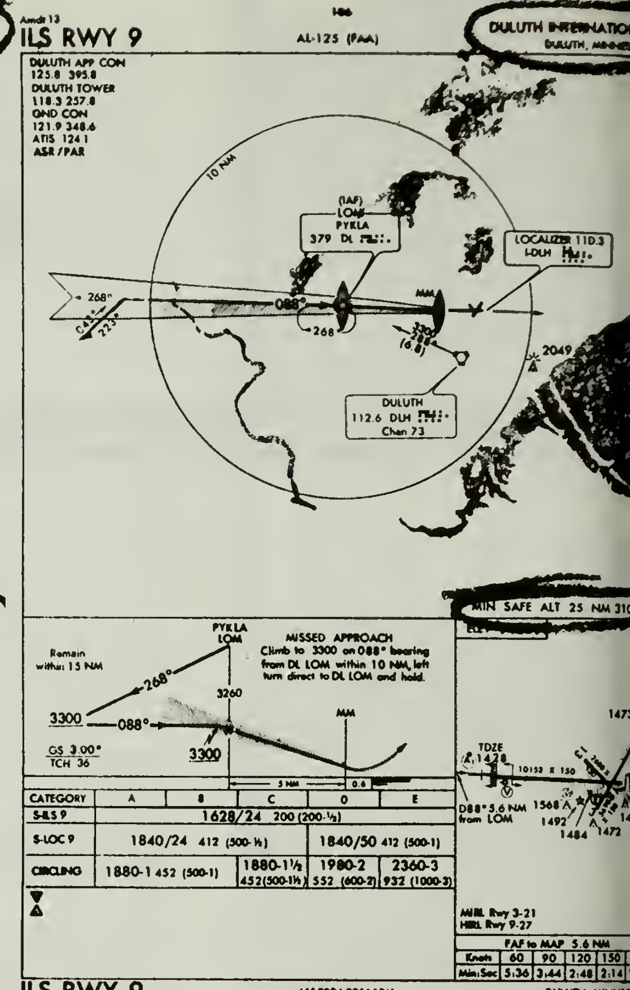




Surprise

MAJOR JOHN N. MODDERS • Safety Officer 133 TAW/SE

Observe the NDB RWY 9 approach plate (above left). One might think that execution of this approach would bring you to Duluth, Minnesota.

Gotcha! Somehow in the printing process, the approach to runway 9 at Fond Du Lac, Wisconsin, became mixed with the Duluth NDB RWY 9 approach. Murphy strikes again!

All items on an approach plate are important, but some are more important than others; such as, minimum safe altitude. At the real Duluth (ILS RWY 9), (above right) the minimum safe altitude within 25 miles is 3100 feet, because of some towers 5 miles east of the field that are 2049 feet MSL. The composite plate (above left) shows 2600 feet MSL. You have just lost 500 feet of protection.

Another cause for excitement would occ when you tried to orient yourself on a circlin approach using the airport diagram given, whic is for Fond Du Lac. Can you picture taxiing Duluth at night using that airport diagram?

Moral of this little story: Be a doubting Thoma Even the trusted approach plate can be in err Compare approach plates for the different a proaches at an airport. In this case, the airpo diagram and the incorrectly placed lakes we immediate giveaways.

Finally, and perhaps most important, che those minimum safe altitudes against eve source of information available. ★

AIRCRAFT ICING

MAJOR PHILIP M. McATEE • Directorate of Aerospace Safety

That time of year is here when we must change our list of things to worry about, from ınderstorms and wet runways to -flight icing and slippery run-ıys. Of course, depending on the ea in which you fly, you may still ve thunderbumpers. Just as in mmer, aircraft icing still occurs. e difference is one of probability d severity.

During the summer, the freezing el is comfortably above us when are making approaches, and route we can almost always get ove the worst combination of isture and freezing tempera-es. Not always so in winter.

First of all, we want the cleanest rodynamically) aircraft possi-. In this we don't really get a oice, but most of our birds are tty clean with very few protru-ns to easily collect ice. Ice will idly collect on any object that sents an uneven surface such antenna masts, etc. The fewer gs sticking out, the better.

wo conditions are necessary he formation of structural ice: presence of visible liquid mois-, and free air temperature at below freezing. Also, the air-surface temperature must be than 0°C. Sometimes, due to il-caused air expansion, the perature of the aircraft surface be about 2°C colder than the ounding air.

ne temperature range in which ice and water co-exist in clouds is generally from 0°C to -20°C. In the atmosphere, supercooled liquid water can exist well below the freezing point of water. In fact, supercooled liquid water has been found at temperatures lower than -40°C and altitudes above 40,000 feet. This supercooled water, although frequently found in an unnatural state, will immediately freeze if it comes in contact with any object (aircraft). Speed also is a factor in ice formation. As speed increases, icing increases up to about 400 kts. Above that speed the icing danger decreases due to heat of friction. Above 575 kts, icing is rarely a problem. For most Air Force jet aircraft, that means the greatest danger is in *visible moisture*, at *below freezing temperatures* and at *relatively slow airspeeds*. Does anytime in a normal mission meet all three prerequisites? You bet—on *approach*. Long let-downs and approaches can add ice faster than you can shake a stick. A long step-down descent followed by an in-clouds approach can give even the best birds a problem. So, enough said. Limit your exposure time in those conditions.

Now, let's review the three basic types of structural icing.

CLEAR ICE

This is a transparent ice with a glossy surface identical to the glaze which forms on trees and other objects during a freezing rain. Clear ice is usually smooth, but if mixed with snow or sleet it can be rough, irregular and whitish. The deposit then can be very blunt-nosed with rough bulges building out against the air flow. Clear ice usually forms on the leading edges of wings, antennae, intake ducts, etc. It is the most serious of the various forms of ice because it adheres so firmly to the aircraft and is very difficult to remove. Formed by the relatively slow freezing of large supercooled water droplets, it tends to spread out and take the shape of the surface on which it freezes. Since very few air bubbles are trapped during the slow freeze it is usually transparent.

Conditions most favorable for clear ice formation are high water content, large droplet size, temperature only slightly below freezing, high airspeed and thin airfoils. Encountered most frequently in cumuliform clouds, clear ice also accumulates very rapidly on aircraft flying in freezing rain or drizzle.

RIME ICE

This is a milky, opaque, granular deposit of ice with a rough surface. Rime ice is formed by the instantaneous freezing of small supercooled water droplets upon contact with exposed aircraft surfaces.

This instantaneous freezing traps a large amount of air, giving the ice its opaqueness and making it very brittle. Rime ice usually forms on leading edges and protrudes forward into the airstream as a sharp nose. It has little tendency to spread over and take the shape of the airfoil.

Fast-freezing rime ice can accumulate when the temperature is between 0°C and -40°C, but is most likely to form between -10°C and -20°C. Although frequently encountered in stratiform clouds, it is also common in cumuliform clouds at temperatures below -10°C. Rime ice is comparatively easy to remove by conventional methods, even though it distorts the airfoil much more than does clear ice. It is also frequently encountered together with clear ice.

FROST

This is a light, feathery, crystalline ice structure of snowlike character. It forms in flight when a cold aircraft descends from a zone of sub-zero temperatures to a zone of above-freezing temperatures and high relative humidity. The air is chilled suddenly to below freezing temperature by contact with the cold surfaces of the aircraft, and sublimation (formation of ice crystals directly from water vapor) occurs. Windshields and canopies are especially susceptible to fast formation if no preventive action is taken. This can be dangerous since outside visibility can be completely lost.

Frost deposits are thin and sublimate or thaw off rapidly with continued flight in warm air.

Icing can affect all external parts of the aircraft, but we will only discuss two critical areas.

WING AND TAIL SURFACES

Ice accumulations on wing and tail surfaces disrupt the flow of air around these airfoils. This results in *a loss of lift*, an *increase in drag*, and increases the stall speed (see Figure 1). The weight of the ice deposit presents less danger but may be deadly if too much lift and thrust are lost.

Experiments have shown that ice deposits of only one-half inch on the leading edge of airfoils on some aircraft reduce their lifting ability as much as 50 percent, increase the drag on the aircraft by an equal amount, and greatly increase the stalling speed. The serious consequences of these effects are obvious. And, it should be noted that one-half inch of ice or more can accumulate in a minute in some cases.

PITOT TUBE AND STATIC PRESSURE PORTS

Icing of these components can be extremely dangerous for instrument flight because it can cause very inaccurate airspeed and altimeter readings. Other instruments such as rate of c and turn and bank could als affected depending on your static system. Pitot heat mus checked on pre-flight and ver that it is on in instrument co tions. Only a few years ago, ar liner crashed when both pi *thought* the heat was on. Also, tic ports can ice and you mus prepared to furnish an alter source of static pressure. member, when in icing conditi the static ports are accumula as fast as the rest of the airc But most of all, ensure the heat is ON and working or whole ball game is already ov

The amount of ice an aircraf accumulate is dependent cor erably on the type of aircraft the conditions. Therefore, the lowing intensity classifications only general. They apply to c and rime ice.

LIGHT—

This is an accumulation o which can be disposed of by icing equipment. It presents serious hazard to aircraft equipped.

Figure 1

EFFECTS OF ICING ARE CUMULATIVE

IODERATE—

Ordinary de-icing methods pro-
de only marginal protection in
is icing condition. Ice continues
accumulate, but not at a rate
erious enough to normally affect
e safety of flight unless exposed
er an extended period of time.

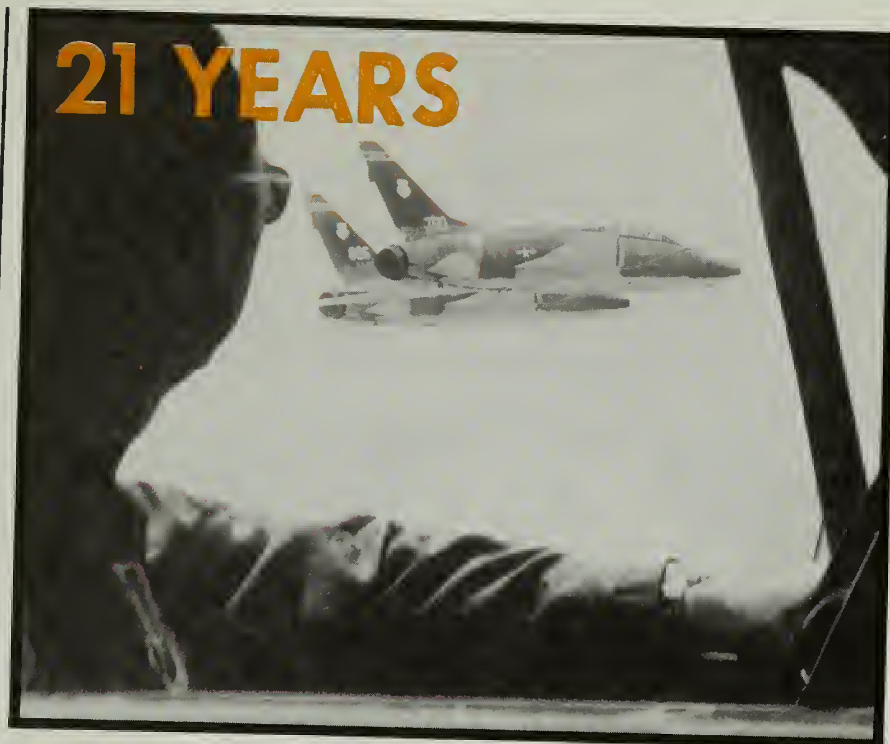
EAVY—

Ice continues to accumulate de-
ite de-icing procedures. The rate
accumulation is fast enough to
use marked loss of airspeed and
itude, and is critical from the
ndpoint of flight safety.

At this point, I would like to men-
n that icing damage to jet en-
es is a very real problem. This
oject is beyond the scope of this
cle, but be aware that due to the
ssure changes, jet intake icing
y form well before conditions
mit other visible structural icing.

is important to realize that hav-
de-icing equipment does not
w one to fly indefinitely in icing
ditions. It will help and give you
to work your way out of the
g situations, but it will not allow
to fly in icing all day long.
re are a lot of reasons why it
good enough and one of the
ones is that it doesn't cover
entire aircraft. Another is that it
n't completely clean off all ice.

, we can form an important
rule: When ice is encountered,
ediately start working to get
of it. Generally, this means a
rent altitude after approval
ATC. Unless the condition is
ing rain, it rarely requires fast
n; but it does call for positive
n. If you follow the first rule,
flight plan to limit your expo-
you will have a good jump on
an winter. ★



21 YEARS

100,000 HOURS Accident-Free Flying

CAPTAIN MARY JO LAUGHLIN • Oklahoma ANG

Major Jerry L. Hume, Chief of Safety of the 138 TFG, Oklahoma ANG, Tulsa, watches two F-100s take off with an intense, yet excited anticipation. Why is this particular flight so special? Because its completion represents 100,000 flying hours without a major aircraft accident. Colonel John F. Loerch, 138 TFG commander flew the historic mission on 5 August 1978. His association with the unit spans the 21-year accident-free period.

Equally as impressive as the 100,000 hours and the period of time this encompasses, are the missions and aircraft included. The unit's last class A mishap was in July 1957, involving the loss of an F-80, but no loss of life. Later that year, the unit was re-equipped with F-86Ds and T-33s and accumulated more than 11,000 flying hours in the following 3 years. In January 1960, the fighter bomber squadron got into the air transport business with the assignment of C-97 aircraft to support the Military Air Transport Service (MATS). This mission continued over the next 12 years and 63,500 flying hours and included a conversion to C-124s.

In October 1972, the 138 TFG reassumed its tactical fighter role with the assignment of T-33s in preparation for F-100 conversion, which was completed the next year. The unit racked up over 18,000 hours in the next 5 years in the F-100.

As of 1 July 1978, the 138th began conversion to the A-7D aircraft, and is now on the way to its second 100,000 accident-free hours. ★

SLIDING HOME

It has been a good day and you see no reason why it shouldn't end the same way.

The runway is in sight five miles ahead and there's light rain, although a heavy shower can be seen at the departure end. You're careful, the landing is normal and the aircraft rolls straight and true. Braking is normal and you discard the idea of catching the departure end cable. Time to turn off—whup! The aircraft suddenly has the bit in its teeth. It turns 180° in a clockwise skid and you end up ignominiously with one wheel off the taxiway in the omni-present ditch.

We've skipped some of the details for brevity, but doesn't this read like chapter XXX—in other words, you've read it before. This crew was the victim of that insidious thing called reverted rubber hydroplaning. This can happen when a relatively smooth surface is lubricated—in this case covered with water—and a tire skids. Heat buildup occurs rapidly and at 600° to 700°F the rubber can revert to its uncured state. It's like you were on a greased sheet of glass; you are helpless.

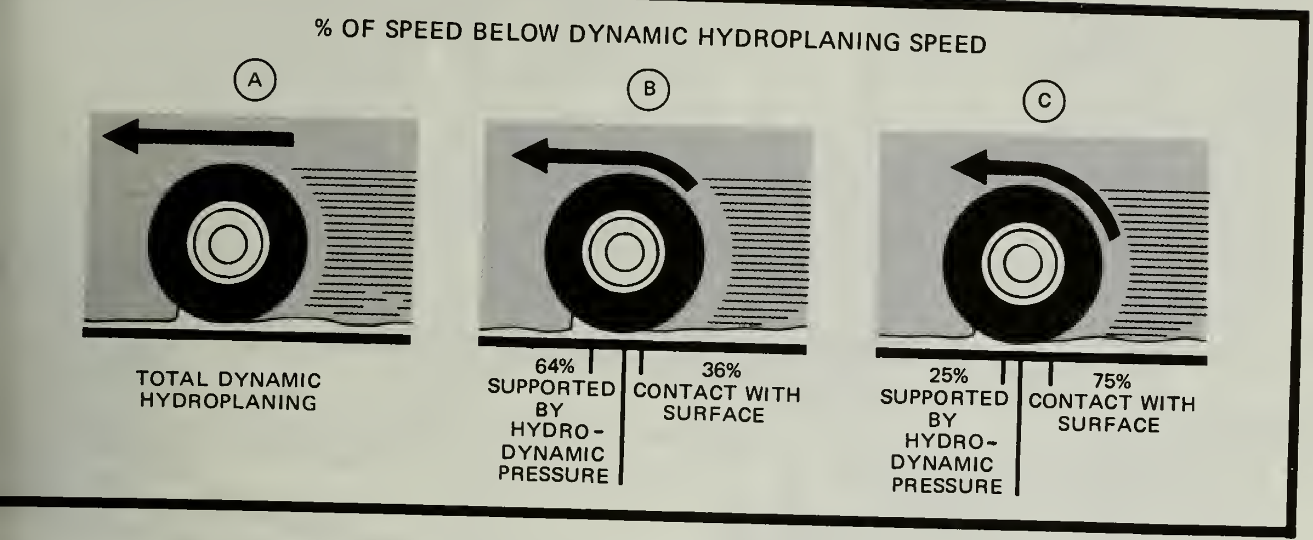
Normally this doesn't occur under dynamic hydroplaning conditions but when a thin film of water covers a smooth runway surface. The condition usually occurs at relatively low speeds and can continue to practically zero speed.

A brief note of explanation for those interested in how this con-dition can occur.

"Researchers in tire characteristics say there are two sources of friction between the tire and the runway surface. They are *adhesion* and *hysteresis*. Where the tire contacts the runway surface high pressures exist, and strong molecular forces can be generated to resist the relative displacement of the surfaces. These adhesion forces resist skidding.

"Rubber has the ability to conform to the shape of the irregularities in the runway surface. The horizontal components of these potential forces constitute the friction

ıre 1



ue to *hysteresis.* If a run-/ay is smooth, such as a mooth glass plate, friction ue to hysteresis becomes egligible. If a runway is lub-cated with water or oil the dhesion forces become neg-gible. One of these two ources of friction is neces-ary. On wet runways the hys-resis component is the only ractical source of friction vailable. However, enough ertical pressure must be ex-ted to permit the tire to eak through the lubrication m and conform to the ir-gularities of the runway rface. . . ."

"Viscous skidding is not, the true sense, hydroplan-g. It's a condition that exists ien the surface is lubri-ted and the *adhesion* forces e significantly reduced. idding starts at lower ake pressures or coef-ents of friction. If the run-y is relatively smooth, heat generated from the dding tire can cause the ber to revert to the un-ed state. . . ."[1]

rtunately this condition is rare than total or partial dynamic hydroplaning which is a fairly frequent experience. In total hydroplaning the friction between runway and tire is negated by water deep enough to raise the tire above the surface, so the tire does not spin up. Wheel brakes are useless. If the runway is grooved or the aggregate is new enough to develop a high coefficient of friction, the wheels can spin up and brakes become effective. On a smooth surface, however, if after the aircraft has slowed below total dynamic hydroplaning speed, it may partially hydroplane (see figure 1).

As winter progresses aircrews will experience a number of different conditions. Depending on the weather, you may have water on the runway, slush, ice or snow, or a combination. (A couple of years ago we ran a little quiz. We're repeating it here, with the answers, to jog your memories of what winter runways are all about.)

Define:

IR08, WR//, SLR16 P DRY, LSR 18, RCRNR, PSR12, SANDED

You, of course, recognize these as runway surface condition readings.

IR08—Ice on runway, decelerometer reading 8.

WR //—Wet runway (decelerometer readings are not reported for wet runway conditions).

SLR16P—Slush on runway, decelerometer reading 16, patchy; remainder of runway is dry.

LSR18—Loose snow on runway, decelerometer reading 18.

RCRNR—Base operations is closed; a RSC / RCR report is not available.

PSR12 SANDED — Packed snow on runway, decelerometer reading 12, runway has been sanded.[2]

Good sliding . . . er good landings this winter.

P.S. There are several reasons why you may not automatically get an RCR. If you don't, ask. It may be the most important single piece of information you will need for a successful landing.

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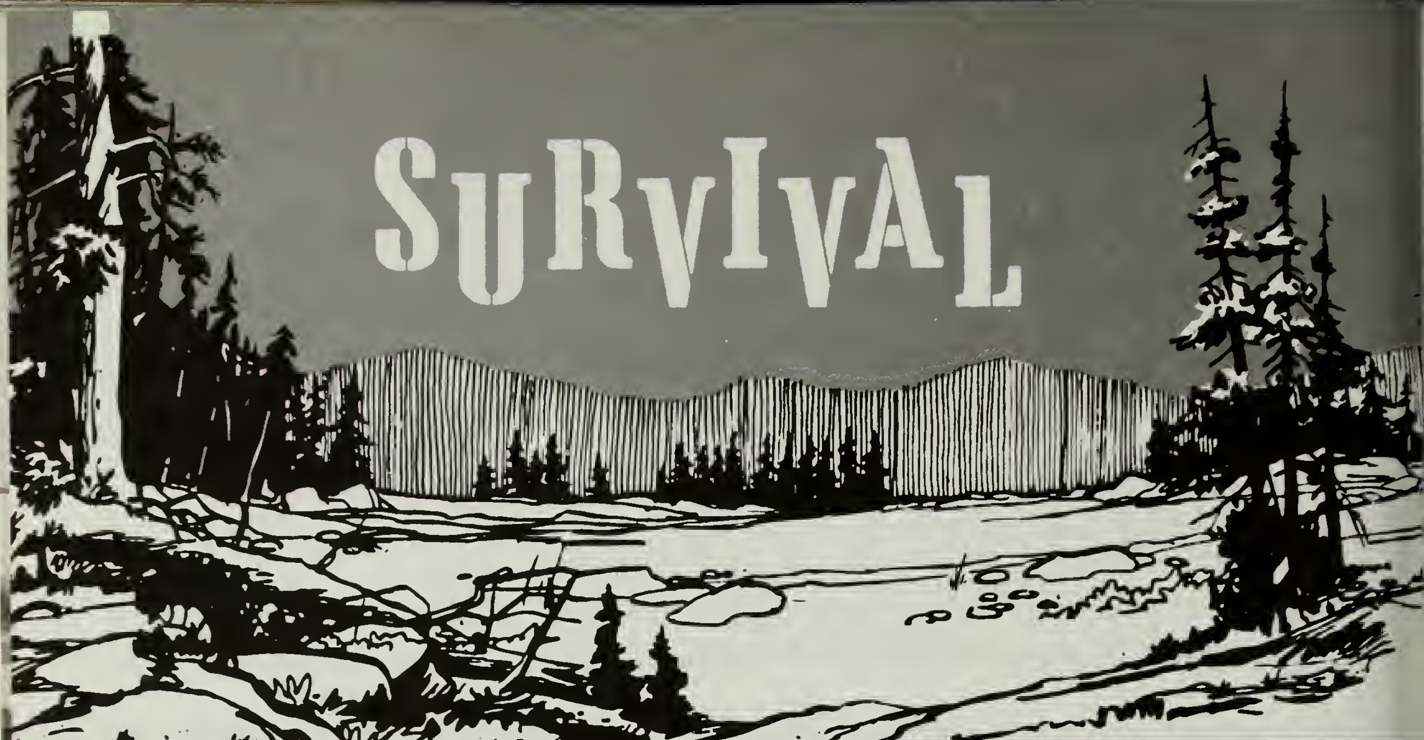

Know Your Enemy

CAPTAIN MILAN J. FRANCESCHI | Operations and Requirements Branch
3636th Combat Crew Training Wing, Fairchild AFB WA

In Southeast Asia (SEA) and with air superiority (AS) only 28 percent of our aircrews were recovered by search and rescue. During a European conflict with the Soviet Union, early AS would be doubtful if they implemented a "First Strike." If our SAR success rate was three out of ten with AS, what will it be when all our aircraft must be dedicated to support tactical and strategic missions?

A European war would be quite different from that in SEA, and we may not be able to dedicate several aircraft just to save one aircrew. We will be flying in extremely hostile airspace. Not only will it be laden with antiaircraft artillery, which proved to be effective in North Vietnam, but the airspace will be protected by the latest state-of-the-art surface-to air missiles and fighter aircraft. This raises the potential of your ending up in the Soviet army's back yard.

In the movie "Patton", George C. Scott outfoxed Rommel because he knew Rommel's tactics. He shouted, "You stupid son-of-a-bitch, I read your book." You probably know all about the MIG series statistics and capabilities, but what do you know about the Soviet ground forces? On the ground, *they* are your potential enemy.

The typical Soviet troop is 19 years old. Very few are career oriented because of rigid adherence to their two-year enlistment standard; therefore, the turnover rate is high – 22% every six months. His life as a soldier is austere: six-day work week, $5 a month paycheck, and normally no leave (10 days in two years if he's a good boy). Since he is accustomed to such strict discipline and living a spartan existence, he makes a good line soldier for he obeys orders without question and can live under primitive conditions. This same quality is also a disadvantage since he has blind obedience to orders, and regimentation spurns any creativity or initiative.

Realism is stressed in every phase of his training. Because of this, 75% of his training is conducted in the field. Chemical, biological, and radiological gear is worn for extended periods of time in field training conditions. Since Soviet tactics emphasize surprise, 20-30% of all training is at night and seldom cancelled due to bad weather conditions.

Unclassified information on what you could expect if captured is virtually nonexistent; however, you can draw your own inferences from Soviet history and this data:

1. Karl Marx in reference to guerilla warfare: "A nation fighting for its liberty, ought not to adhere rigidly to the accepted rules of warfare . . . ."

2. Evidence of what they have e (callous brutality) to their own ple to compensate for insufficient nical capability: Parachutists e dropped (without parachutes) in s stuffed with hay into deep v.

In *The Gulag Archipelago,* ksandr I. Solzhenitsyn describes 31 rogation methods (psychological physical to include torture) h were used against Soviet ian prisoners. Sleep deprivation the most used method. Also, ners were tried in accordance laws promulgated today for past ns.

ere are some bits of information h may help you when on the nd:

. Enlisted men are trained to accurately under low visibility at ing targets and from moving cles. (He's a good shot, don't your luck.)

. Routes of travel are marked in nce by scouts. (You may be able e where a unit is traveling for igence purposes or to stay out of ay.)

. Scouts are sent out 100 meters eters at night) in advance with ecurity 200 meters in back of ain ground forces. (If a couple d guys pass by, hold your d for many more may follow.)

Extensive use is made of and booby traps in defensive forested areas, and during rawals from an area. (Avoid areas if practical when ng.)

U-shaped apertures and shields clear attack are built at regular als in the lines. (An abandoned position may have a radiation already constructed. It could t you.)

Crews stay with damaged (Do not bother dead tanks.)

Recon patrols are sent out day ght to take prisoners. (The does not sleep at night.)

A column passing through a will normally put out foot on parallel trails. (If you run

into one foot patrol, a 90° escape route may run you into another foot patrol.)

9. Offensive operations are avoided in the forests. (A good place to evade, but watch out for mines and booby traps.)

10. Recon helicopters have IR spotting equipment. Search lights are displayed 10-15 seconds then turned off. (They can see you at night. The search light pattern may enable you to move to a more advantageous position.)

11. Radar, sound, and heat monitoring devices, and night vision devices are operations normal. Night vision devices are not effective in fog or heavy rain. (They don't have to see you directly to find you, but the best time to travel is under cover of fog or heavy rain.)

12. Rest stops range from 5-10 minutes on short nights to 20-30 minutes on long nights. (If they stay in position longer than that, they are probably setting up camp.)

13. Paths through mine fields are marked with one way different colored glowing markers. (Your route of escape through a dangerous area may be marked for you.)

14. The soldier's first aid kit is covered with rubberized cloth and sewn into his tunic. He also carries one emergency ration which may be consumed only when the division commander orders it. (If you find a body, take these items.)

15. Due to 22% of combat units changing every six months, tactics and maneuvers must be standardized and are therefore predictable. (Study his tactics.)

16. Troops will dismount from APCs when threatened with mines or anti-tank weapons. (If you spot this kind of activity, don't follow them.)

17. Only officers have maps. Map overlays are not used—they mark directly on the map. (If you find a map, you're in luck.)

18. In deep snow conditions, they operate in open areas rather than in forests. (Again, forests are a good place to hide.)

Soviet doctrine emphasizes surprise, speed, and offense. Long winter nights, snowfall, blizzards, fog, and strong frosts can be used to achieve surprise. They used these tactics in World War II with excellent results.

The Soviet soldier is well-trained physically and mentally for living in adverse environmental conditions. He will probably attack you during inclement weather on a holiday. During the first few days of the war, your chances of being pitted against him are high. He has the hammer—you should know a little bit about him. Are you prepared?

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NEWS FOR CREWS

Information and tips to help your career from the folks at Air Force Military Personnel Center, Randolph AFB, TX

COLONEL HENRY VICCELLIO, JR.
Chief, Rated Officer Career Management Branch • Air Force Manpower and Personnel Center

FIGHTER PILOT ELIGIBILITY CRITERIA FOR THE F-15, F-16, A-10

Why didn't I get an F-15? . . . I've got all kinds of squares filled. Why is there a Short Tour Return Date (STRD) cutoff for conversion into new fighters? . . . I just came back from remote, so why couldn't I go to Eglin?"

I hear these and similar questions constantly in conversations over the phone and during my visits to the field as Chief of Rated Assignments at MPC. It's obvious that many folks currently receiving other than new fighter assignments are unhappy, and—in some cases—separate rather than accept the assignment they've been selected for. In response to these concerns, my intent with this article is to provide you with a clearer picture of our game plan in manning the new generation fighters and your role in that plan. The audience I'm addressing this to is those of you who are current or previously qualified tactical fighter pilots who have achieved the experienced (500 hours mission time) category, but aren't currently stationed at a unit undergoing conversion. I won't address the assignment outlooks for UPTs, first assignment IPs (FAIPs), or inexperienced fighter guys, since they are considered differently and handled under different rules of engagement.

SHORT-TOUR ELIGIBILITY

Most folks get emotional about remote tours—more specifically, why the STRD is such a big factor in new fighter assignments. To explain why it's this way, let me set the stage by reviewing our general concept of new system growth. To keep up with the production line at minimum aircrew training cost, a five-year period of in-system utilization is planned for all the guys assigned to the new systems. This means guys who check out in the F-15 between 1976 and 1982 have stayed, and will continue to stay in that airplane—few, if any, PCSs to staff/AFIT/supplement/other cockpit jobs are planned. Since no extra RTU training is available to qualify a backfill if we did reassign them out of the system, we plan on keeping them there to maximize system growth and get each converting unit up to full manning as fast as possible. Needless to say, these guys won't be pulling any short-tour duty—flying or otherwise—since the new syster aren't yet based remote. For two reasons, therefore, impose a STRD criteria on new system eligibility. Fir we have to identify and protect a group of guys suffici to sustain our short-tour requirements over the five-y period that each of the new systems are levy-exempt. C current cut-off dates do just that, and with *no* breathi

TABLE 1
NEW SYSTEM CONVERSION ELIGIBILITY CRITERIA

Short Tour Return Date (STRD)

Number of Remote Tours	Minimum STRD (or more recent.) F-15	F-16	A-10
0	Jan 74	1 Remote required	F-4 Jan 74 Non F-4 Jan
1	Jan 71	Jul 73	F-4 Jan 71 Non F-4 Jan
2	No STRD Requirement		

Oversea Duty Selection Date (ODSD)

Converting MAJCOM	Minimum ODSD (or more recent.) F-15	F-16	A-10
PACAF/USAFE	NA	NA	NA
TAC	Jun 72	Jul 73	NA

NOTE: Inventory/requirements are reviewed semi-annually for possible readjustment of STRD/ODSD criteria

room. (Table 1). In fact, as soon as we determine t changes in inventory or requirements will allow us to mo the date back, we do so—and have done so twice thus for the F-15, making more of you eligible for conversi Looking at it from the other side of the cutoff point, let relatively short-tour-eligible guys convert would unfair to others who might then have to go remote wit more recent STRD. The key factor is RTU training ca bility—since it'll still be there after the production li slow down at the end of the five-year "growth perio we'll be able to start moving the new-system "old head to other jobs—including their fair share of assignments short-tour areas. This should happen in the '81 time fra for F-15 jocks, '82-'83 for A-10s, and '83 and bey for the F-16. So hang in there; if your STRD needs update, go get it! Twelve to 18 months down the ro you'll be on the move with a very recent STRD—b points decidedly to your advantage. Without that upd your chances of getting a piece of the action are virtu nonexistent.

HERE THE ACTION IS

For those of you who have recently completed a short ır but *still* can't seem to get into that new fighter, let : now discuss our conversion methodology and how u can maximize your chances.

During the five-year "growth period" for each sys-

Typical Converting Unit Resource Mix

)n-Station Resource (experienced & inexperienced)	40%
lew System Experienced Cadre	15%
/orldwide Resource	15%
PT/FAIP	30%

FIGURE 1

I described above, all opportunity for experienced ter pilots to enter new systems comes through their signment to a base undergoing conversion to that sys- – either just before the conversion starts, or during process, which lasts about a year for the average wing. en our current rated management philosophy of (1) all ational fighter aircraft sharing in the production of fighter pilots, (2) the requirement to minimize PCS ;, and (3) the necessity to provide a nucleus around h a new unit is built, the composition of a conversion ; can be broken into four categories: the on-base re- ce, the fair share of UPTs and FAIPs, the system- rienced cadre, and the worldwide available fighter ırce (that's you).

gure 1 shows a typical conversion squadron by source. 've been trying to maximize the on-base resource to PCS funds and enhance unit continuity through the ersion. We keep the UPT/FAIP input as high as ble to maximize the absorption (production) of new er pilots, thereby reducing the traditional high flow gh F-4 units. The cadre provides the system famili- that's essential to rapid unit tactics development. ›u can see, only a few new system slots are currently ıble for you experienced guys on the move. We do est to spread these slots around and offer equal op- nity. We don't apply any additional eligibility a; in fact, the timing between a pilot's availability ıe training slot is often the biggest player. To im- this opportunity, we're currently taking two actions. we're notifying the proportions of cadre and on- ı resource so as to increase inputs from the world- resource. Our experience through four conversions dicated that we can increase the number of on-sta- 'orldwide convertees while maintaining the desired levels of theatre and mission experience. Second, we have been working with TAC/DOOT to make certain modifications in the F-15 training syllabus that have allowed the entry of a few extra folks – mostly on short notice, but all from the worldwide resource. We intend to pursue both these initiatives to the max extent possible.

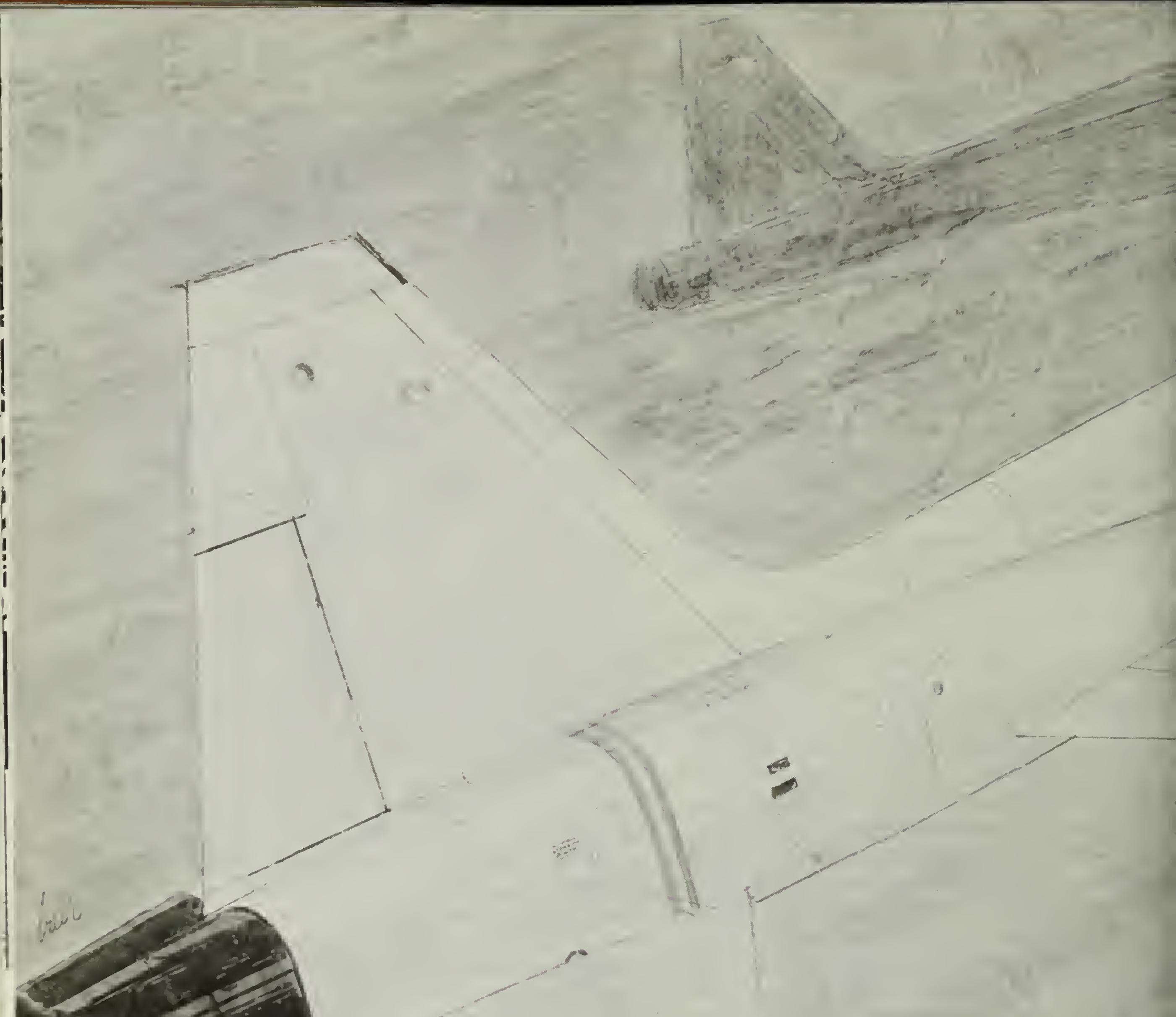
THE BOTTOM LINE

As the foregoing points out, new system opportunity is currently slim among experienced fighter pilots at non-converting units. The most common misperception I hear is that . . . "If I don't get into a new system now, I *never* will." Nothing could be further from the truth! It's simply that the numbers can't make it happen for the big majority of you at this particular point in time, since only 20 of our 118 tactical flying squadrons are currently equipped with new systems. Before you FACs, ALOs, staff guys, and Phantom drivers slit your wrists, however, let me reiterate that this limited opportunity – currently about four percent or so – will grow by 1983 to over 60 percent, and will be over 90 percent just a few years later! In 1985, for example, the 20 squadrons cited above will have grown to 74. Knowing that you mid-to-senior captains are most concerned about timeliness of *your* conversion opportunity, let me offer a few observations. First and foremost, if you like your present job, stay put and perform well. Time is on *your* side, and if you're doing well in the mainstream of the fighter business, I wouldn't want you to move unless absolutely necessary. If you've been thinking about a staff or non-flying tour but aren't sure of the best timing, perhaps now would be best, returning to cockpit duties when new systems have opened up more. If, on the other hand, you're the impatient type who wants to accelerate straight up or shoot tanks at 5,000 feet slant range *right now,* the bottom line is simple – get your STRD updated if you need to, and get to where the action is! Search out the (classified) conversion planning for the system of your choice, volunteer for duty at bases scheduled to convert, be there with sufficient retainability to convert, and perform well. If you're as serious as you claim, you'd better get moving – the line to Kadena is already forming!

Hoping that this article has avoided the "blowing smoke" so often associated with us personnel types, I invite your feedback to myself, my Fighter Shop, or your MAJCOM rated career managers. We favor two-sided conversation, and are doing our best to "tell it like it is."

ABOUT THE AUTHOR

Colonel Viccellio is currently Chief of Rated Officer Career Management at AFMPC, and is a member of the Air Force Readiness and Conversion Committee which is tasked with the overall management supervision for the TAF conversion. His background includes tours in the F-100 and A-1, and duty as an F-4 ops officer, squadron commander and ADO in the 33TFW at Eglin AFB, FL. ★



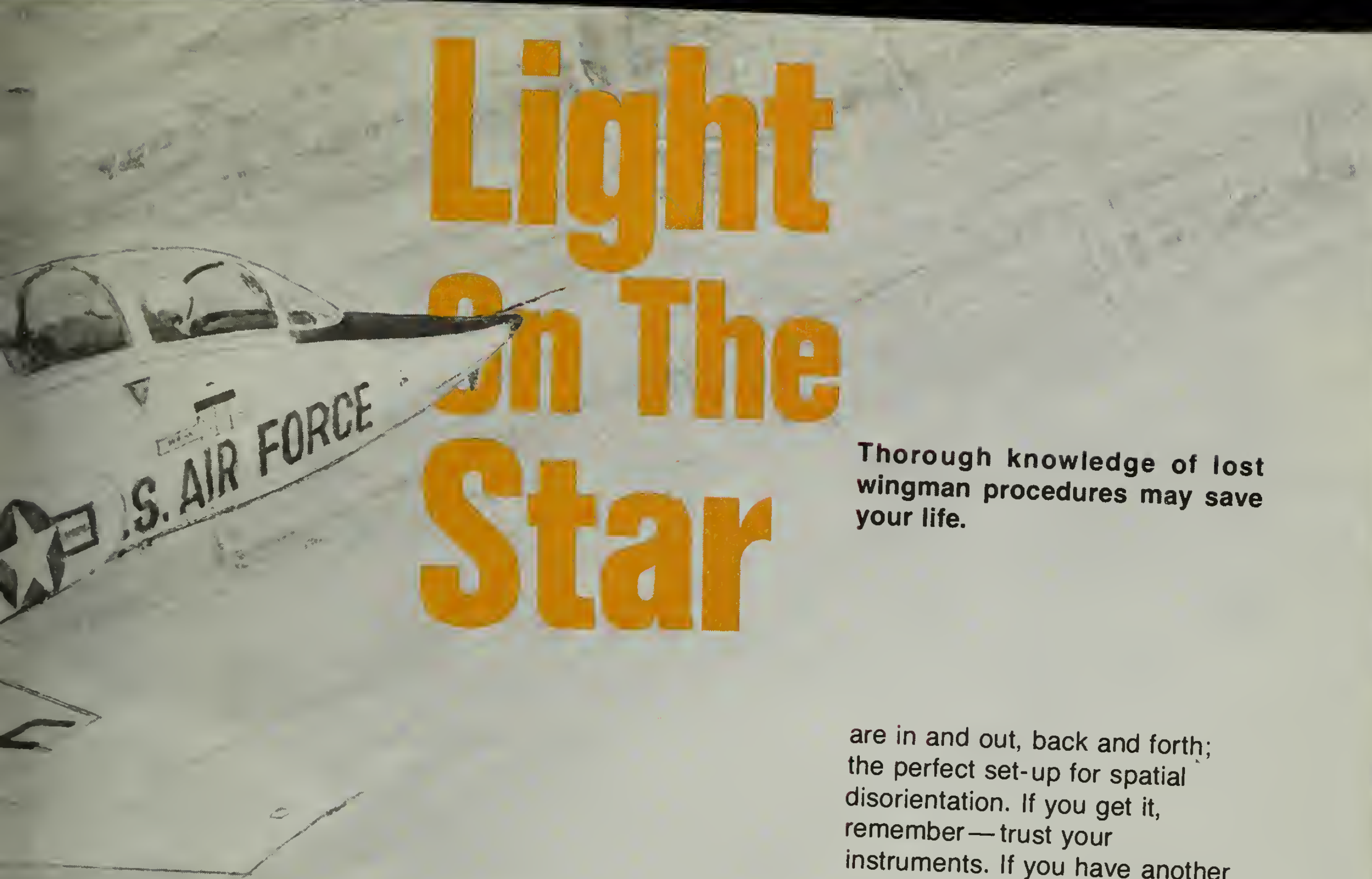
MAJOR PAUL L. TILEY
Directorate of
Aerospace Safety

The clouds were getting thick, but I could keep the "light and the star" in sight most of the time. Then the flight went into another cloud bank. One, two, three seconds and I still could not see lead. "Blue 4 has lost you, lead. I'm going lost wingman."

A lost wingman procedures briefing is one of those briefings that tend to get passed over with the phrase, "lost wingman procedures are standard." True, the lost wingman procedures we learned in the T-37 are the same ones we are using in our newest aircraft. But, recently we have experienced an increase in fatalities during lost wingman procedures. The procedures ar easy to memorize, but do we really understand them?

During your preflight plannin do you, as a flight lead, consid the weather, the real need to penetrate the weather in formation, and your wingman's ability? You might be able to rearrange your sequence of events to avoid the worst weather. Or, you might be able arrange a radar trail departure.

As a wingman, do you take p in the preflight planning so you know where you are going? Or do you expect the flight lead to do it all? When you acknowled the clearance prior to takeoff, d you really understand it? If you



Light On The Star

Thorough knowledge of lost wingman procedures may save your life.

to go lost wingman, will you
mbling to get your SID book
Will you know the next
point on your route of flight?

ce you're airborne and in the
er, what happens when you
t wingman? The purpose of
ingman procedures is to
e separation from the rest of
ght. But, how do you, as
ead or wingman, ensure
ation after the initial move?
55-series regulations
e the flight lead to transmit
ading, airspeed, and
e to help ensure
tion. If you, as the lost
an, can determine an
e or DME separation then
accomplished the
ep.

can't stop flying your
there. What do you do
You transition to
ents and, since you are in

the weather, contact the controlling agency for a separate clearance. The controlling agency can help you ensure your separation from the rest of the flight. If you are having radio problems, and can't contact the controlling agency, squawk "emergency" and proceed on the flight plan as cleared. Don't be afraid to squawk "emergency"; that will ensure the controlling agency keeps the rest of the flight away from you.

Let's talk about transitioning to instruments. AFM 51-37 has a good section on spatial disorientation. This may well be your worst problem. Why spatial disorientation? Consider, you have your head turned left or right, concentrating on keeping the "light on the star," and you've been going in and out of the clouds. The "light on the star" fades out, you wait, but lead is gone. You get worried and start trying to fly instruments while cross-checking outside to see if you can pick up lead. Your eyes are in and out, back and forth; the perfect set-up for spatial disorientation. If you get it, remember — trust your instruments. If you have another guy in the aircraft, tell him you are disoriented. He may or may not be able to help you.

If, while ensuring separation from the rest of the flight, or while transitioning to instruments, you lose control of the aircraft, you still have an alternative — EJECTION! Most flight manuals say that if you are out-of-control eject at 10,000 feet. That one last attempt to save the aircraft is the one that kills.

If you do everything right, you keep your separation, you transition to instruments, and you get your own clearance; DON'T be in a rush to rejoin with the rest of the flight. Too many pilots, who have done everything right, catch a glimpse of the flight and try to rejoin before they lose sight again. Very few of them make it. If you have your own clearance and hard altitude, maintain it until you are SURE you can make a controlled rejoin. If you can't make a controlled rejoin, talk it over with lead on the radio. The best course of action may be to RTB. ★

Rex Riley on the road again! This trip we visited eleven bases and received some super service from most. The common denominator to good transient service seems to be attitudes and lateral cooperation. We also picked up some feedback from aircrews and TA folks which is worth passing on.

INFORMATION

Aircrews—To save you some embarrassment, hassle and frustration, let me remind you that the good old days of being met by the TA folks **with tools** are mostly gone. In the battle against cost and FOD, the CTK (Consolidated Tool Kit) program was born. This system provides a centralized and inventoriable tool supply to be signed out on a task-by-task or shift-by-shift basis. This is an over-simplification of the system, but essentially it means that ramp folks aren't carrying all the tools they used to. Many TA outfits have thru-flight or BOP "mini-kits," but they can't possibly carry all types of tools necessary. Moral—Be a little sensitive and try to work with the system. The same program that causes the TA folks not to have all those tools may also save your engine.

Don't depend on the computer to get the next leg of your stopover to your destination. I'm not down on computers, but if you have several legs that are short, you may beat your inbound flight plan! A phone call to base ops or TA at your stops may prevent TA from being surprised by your arrival and, therefore, smooth your turn.

Retained Awards

WRIGHT-PATTERSON AFB,

Good service and facilities! of the best flightline snack around. A very spread out but transport and availability i cellent. If you plan to RON ahead for reservations to av possible long ride to the other of the base. Lots of other dromes and slow-movers ar so keep your head out and open.

ROBINS AFB, GA

Continues to be a super to stop or turn. Lots of traffic crowded ramps makes taxi tion a necessity. Best qua we've seen in a while. Folk really tryin'!

w List Additions

NDENBERG AFB, CA

quiet, pretty place on the coast! y open duty hours, 5 days a ek, but good service and fa- es. No barriers, 8,000 foot run- and always file an alternate Supp.).

DREWS AFB, MD

ney really have their act to- er! Attitudes and performance e definitely become service nted! CAUTION: Lots of traf- ramp freezes, VIP priorities other unique problems require e empathy and forethought on art of aircrews. Despite these problems, Andrews folks are g hard. Work with them, try o surprise anyone, and you'll vell taken care of!

TTSBURGH AFB, NY

od TA service and ops facil- ood and lodging are a little nt, but good transport will ou get there OK.

UMBUS AFB, MD

T traffic and multi-runway ion make this another place es open on arrival and de- e. Good service, base ops uarters if you plan an RON.

ILL AFB, FL

e a little extra gas for vector- und the St. Petersburg land- on arrival to MacDill. Also t let the 500 foot wide run- onster getcha! A fast turn peak Phantom time may roblem due to gas or AGE ility, but MacDill TA folks ! Same advice—don't sur- em! If you've got strange nents, bunches of aircraft all arrival times, give them an advance phone warning. Outstanding stopover.

PATRICK AFB, FL

Super facilities! Not too much transient traffic but a lot of local training and light plane sightseers up and down the coast. IFR Supp says up to 4-hour delay, so call ahead if you're in a hurry.

NO CIGAR: A pair of bases we visited have some problems. No names, but don't let a guilty conscience bother you unless . . .

• Base X—might have just as well been closed. Lackadaisical TA, ho-hum fuel truck driver, dark and almost empty base ops, nonexistent transport. You'll know it if you stop there!

• Base Y—Super quarters, food facilities, base ops. TA and crowded ramp is dangerous. TA is severly undermanned for the ramp situation, hours of operation and traffic amount and variety. Base aircraft parked on transient ramp causes unhealthy taxi and parking situation. If the shoe fits . . . .

A Commercial Message: I've gotten some comments like "Arrghh, you're putting them on the Rex Riley list; I really got a bad deal at that #*!!;! base!" Keep in mind our visits are a one-time every two year-or-so stop for often as little as two hours.

Hopefully, we arrive unknown and wander around attempting to get an objective view of the service and facilities. We may or may not succeed. A base may know we are coming; we may hit them at a slack time or for some other reason we may get better (or worse) treatment than the average jock. That's exactly the reason we depend on info from airplane drivers to supplement our evaluations. Keep the cards and letters coming! ★

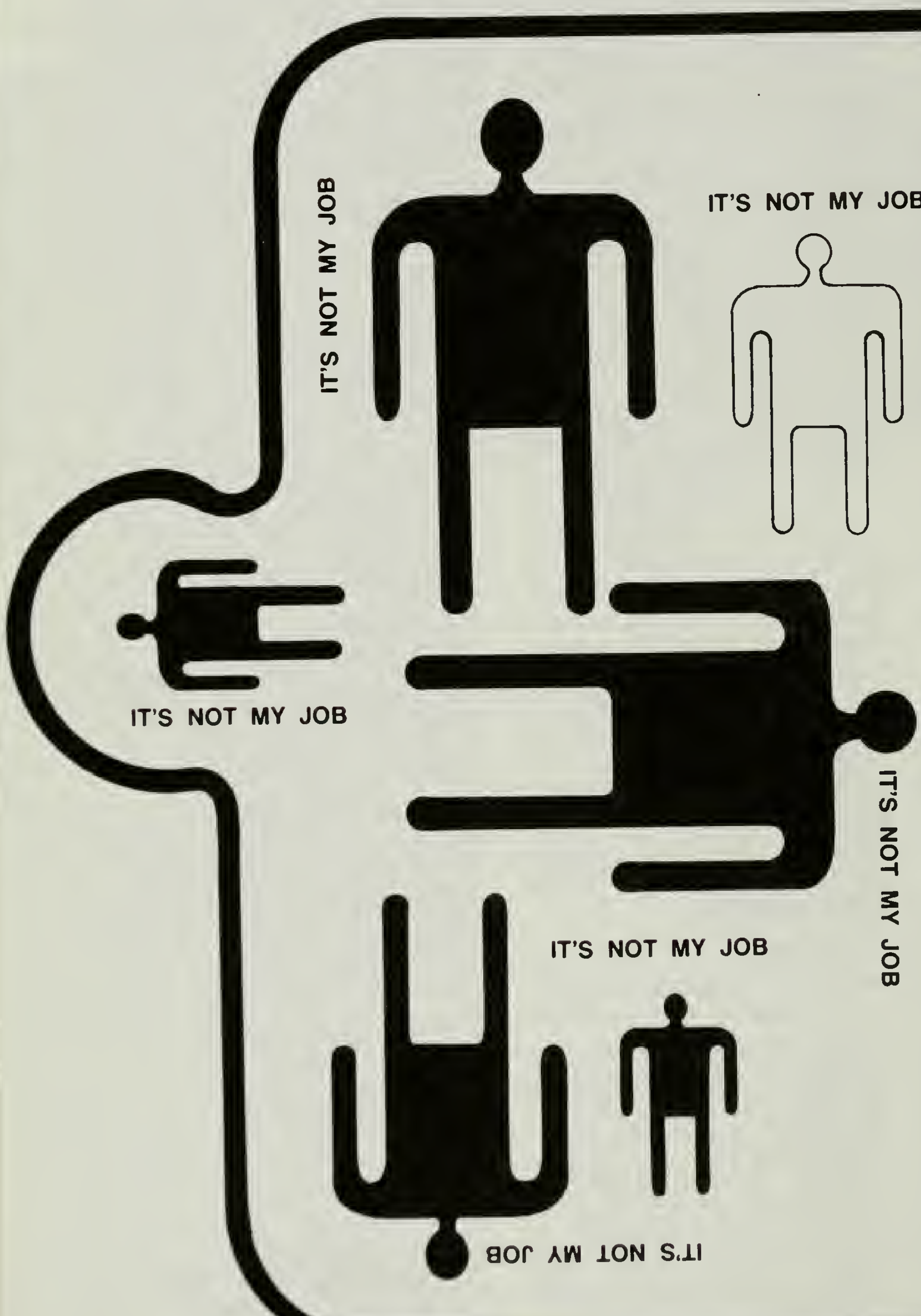
THE

REX RILEY
Transient Services Award

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
ENGLAND AFB	Alexandria, LA
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AL
PETERSON AFB	Colorado Springs, CO
RAMSTEIN AB	Germany
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
TORREJON AB	Spain
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
NORTON AFB	San Bernardino, CA
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
CARSWELL AFB	Ft. Worth, TX
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayeteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND
VANDENBERG AFB	Lompoc, CA
ANDREWS AFB	Camp Springs, MD
PLATTSBURGH AFB	Plattsburgh, NY
MACDILL AFB	Tampa, FL
COLUMBUS AFB	Columbus, MS
PATRICK AFB	Cocoa Beach, FL

CREW TAS

CAPTAIN EUGENE CAISSE • Directorate of Aerospace Safety



How often have you
that expression? On
place aircraft, crew m
job specialization freque
sults in the feeling that if
falls within the other perso
description, then it is that p
responsibility alone. I've
some crew members wh
sciously believe this; but
the time, this kind of a
sneaks into a crew's actio
out the crew members
aware of it.

Let's look at one crew
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on the market of crew tas
tion. Also, the actions a
tudes of each crew mem
not necessarily reflect on
actual crew members of th
speciality.

SOLATION....OR...
"IT'S NOT MY JOB"

aft Commander
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er

: 0730 on mission plan-

e: The squadron mis-
g room.

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e table and the pilot, the
gunner enter.

ave you got the flight
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ht, but Scheduling just
and changed every-
o I hafta start all over.
hat really puts us be-
ell, hurry up and finish
you stay here and see
ch of the fuel log you
The rest of us will go
t some breakfast as
there's nothing for us
e'll be back in an hour.
done by then because
brief at noon. I've got
do this afternoon.
luck. Now we'll blow
part of the day on mis-
nning. Let's go eat.
e breakfasters have
½. You'd think those
uld hang around and

CP: Sure would like to upgrade soon.

Two hours later, the pilot, RN, and the gunner return from breakfast.

P: You guys got the mission done?

N: Almost. Sure could have used some help, though.

P: You're the nav—the flight plan is your job. Now, let's get going. We've got target study in 10 minutes.

CP: I don't have the fuel log done yet. Why do I have to go to target study anyhow? That's navigator business.

P: We have to go. By the way, has anyone seen the EW today?

G: He's in the crew lounge. He got here about 15 minutes ago.

P: Go get him.

The EW enters, carrying a cup of coffee and a copy of "Scientific American."

EW: Hi, guys. When do we brief?

P: Where have you been? Mission planning starts at 0730.

EW: When I get here at 0730, all I do is sit around and do nothing until it's time to brief. My mission planning only takes about 20 minutes.

P: Well, we're supposed to be here at 0730, and that means all of us. Gunner, you draw the pilot's chart while we go to target study.

(The pilot, copilot, radar nav, and nav go to target study and return in about an hour.)

P: Okay crew, let's finish this up. We'll brief at noon.

N: I don't know if we can be done by noon. These scheduling changes are complicated.

RN: Yeah, and I have to compute timing charts for these new targets.

P: You can do that after the briefing. I want to brief at noon so that I can paint my house this afternoon.

Time: 1330. The briefing is over. The pilot, EW, and gunner have gone home.

N: I need someone to help me check these courses and distances.

CP: I found a slight error in the fuel log. This will keep me busy for a while.

RN: I've still got to review the aircraft history. Those guys always run off right after the briefing. I wish they would stay around and help.

The time: 0530 the next day.

The place: Base Ops. The crew has assembled for the flight.

P: Hey Co, let's check our clear-

CREW TASK ISOLATION continued

ance against the flight plan.

CP: Job Control just called and changed our tail number. I've got to recompute weight and balance. Also, the NOTAMS have to be manually checked today. We're not going to have time for coffee.

P: Where'd the rest of the crew go?

CP: They've gone to breakfast. I wish they had hung around to help.

Thirty minutes later, in the snack bar. . . .

N: The pilots didn't get in here to eat. I wonder what they're doing?

RN: They probably got busy. But don't worry about them. The pilot didn't worry about us yesterday after the briefing and we got busy and he went home.

EW: Did anyone ask the pilot when bus time was? It ought to be about now.

N: Don't worry about it. When he wants us he'll come and get us.

About 10 minutes later, the pilot sticks his head in through the snack bar doorway and says, "Let's go, we're late." The crew gets on the bus and heads for the aircraft.

Let's analyze the pre-mission activities of this crew, specifically looking for areas where the lack of crew empathy causes potential mission degradation.

The crew assembled at 0730 on mission planning day. The navigator had constructed the mission the night before and was prepared. However, an unavoidable scheduling change necessitated a flight plan revision. The pilot, believing that flight plan construction is exclusively navigator business, decided to leave until the flight plan was done. The copilot, working on the fuel log, remarks that he would like to upgrade soon so that he can be an AC and go to breakfast while the other crewmembers work.

Later, the copilot objects to being required to attend target study, remarking that it's "navigator business." He doesn't realize that he is an essential part of the bombing team. This probably isn't his fault. His navs don't use him as they should.

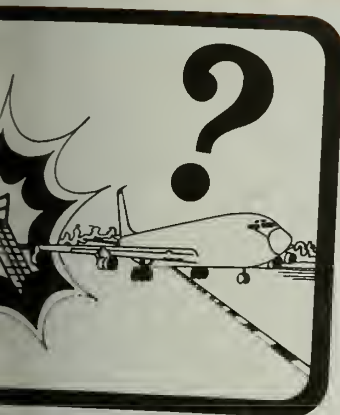
The Electronic Warfare Officer is really in left field. He's the most specialized member of the crew, and he uses this fact to isolate himself. He can't see why he should have to spend the entire day with his crew when his specialized mission planning activities take only a short time. Again, we see a case where the crew is not using him as the valuable resource that he co
be.

The crew completes the for
briefing, but there is still much
done. The paperwork needs to
checked, but that's navigator
copilot business. The pilot g
home. No empathy. No crew c
dination.

The next morning the tables
turned. After the weather brie
the navs disappear in to the sn
bar, while the pilots wrestle
all those little pre-mission de
and changes. The navigators
press little concern about whe
or not the crew arrives at the
craft on time, believing that
"pilot business."

This fictitious scenario show
how crew task isolation degra
crew members' working relati
They may fly a good mission,
after the trying mission plan
session, they are probably n
their psychological best. Or ma
they won't fly such a good mis
because one overworked
member made a critical paper
error while the person who sh
have been checking it was e
breakfast or painting his hous
takes a well organized and i
rated crew to safely fly a com
mission, not several indepen
specialists. That's why it's call
"crew." ★

OPS TOPICS



GROWTH

KC-135 pilot, at a commercial
pick up passengers, was con-
about the proximity of a pas-
loading stair parked about 30
ward and 18 inches left of the
g tip. When he requested it be
he was assured that the mar-
could safely handle it. They
d the wing tip struck the stand.
of the location of the turn pivot
e wing swung out an extra
t and once the turn began the
ld not miss the stand.

GHTER
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ry 1979 marks the 25th an-
of the first flight of the F-104
er. To commemorate this
reunion will be held in
Arizona, 15, 16, 17, and 18
979. Anyone who has flown
4 or has been closely as-
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vited to attend. For further
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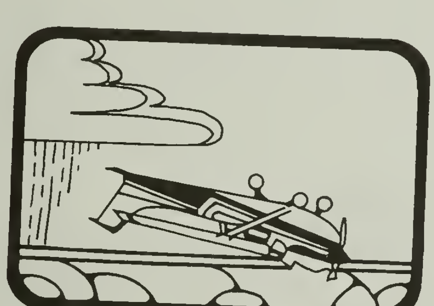
d Park, Arizona 85340

AIRCRAFT & THUNDERSTORMS DON'T MIX

Recently, two similar mishaps in which Aero Club aircraft received major damage illustrated, yet again, that aircraft—of any sort—just don't mix well with thunderstorms. In the first case, the Cessna 172 pilot had planned his return from a local flight to just beat the expected arrival time of the storm (no comment). He landed in the clear, but on taxi the aircraft was flipped over onto its back by the first gust of the thundercloud.

In the second case, another Cessna 172 pilot was told (some way out) that a cell was located seven miles north of, and not expected to affect, his destination. Sure enough, the storm changed direction in time for the gust front to upset the aircraft as it taxied to parking.

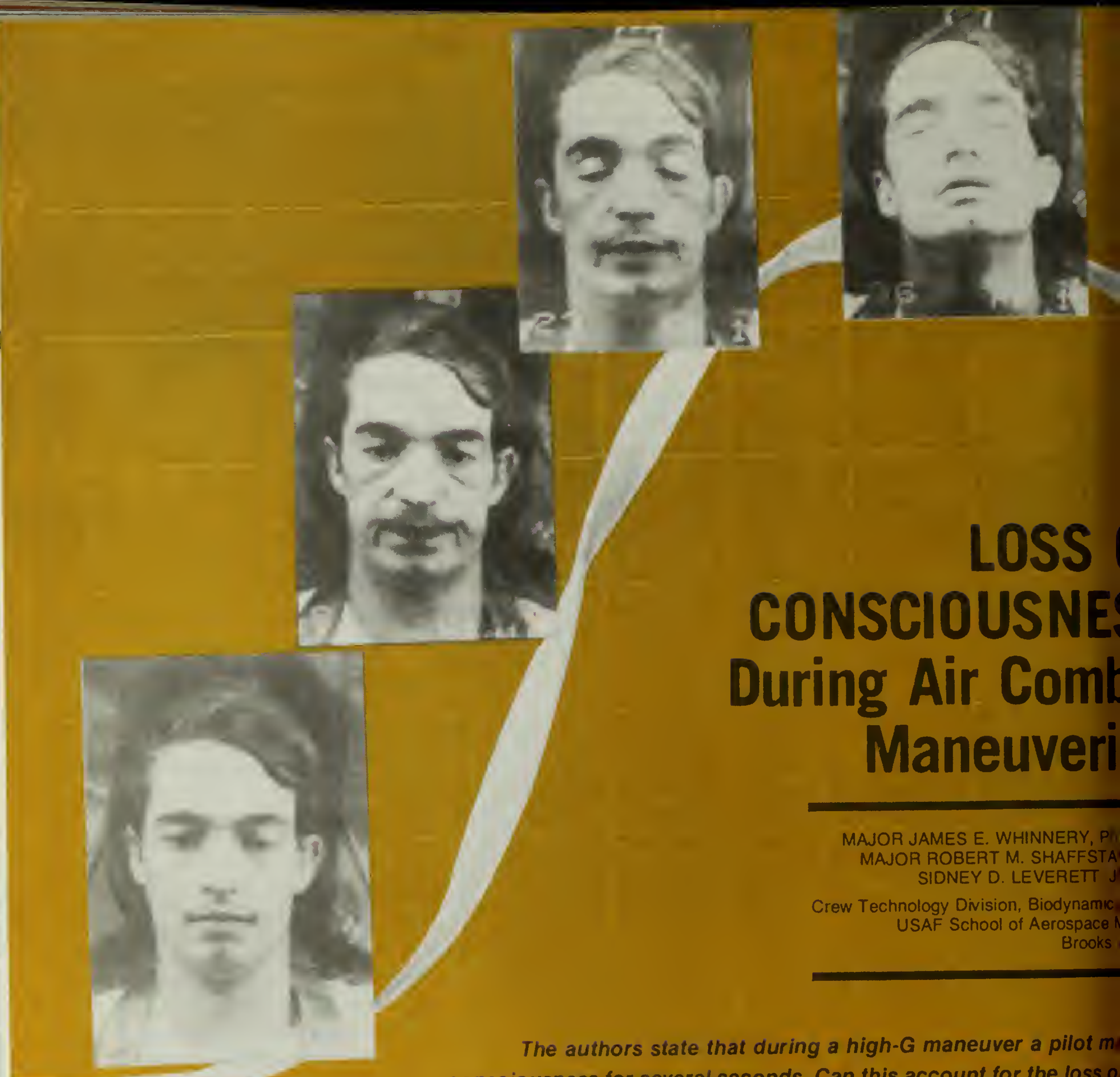
In both cases, the pilots were some distance from any visual indications of hazardous weather during approach and landing. The second case, particularly, is a striking example of how quickly a situation can deteriorate; in the space of a couple of minutes, reported wind at the field went from 250/18 vis 8 miles to 350/35 gusting 50, vis ¼ mile.—Sqn Ldr Peter White, RAAF, Directorate of Aerospace Safety.



VALUE YOUR TAIL?— CHAPTER TWO

Chapter one of this saga can be found in *Aerospace Safety*—May 1978. Chapter two is as follows: A C-130 was on a support mission to the "same" remote site outside the CONUS. However, the plot changed from a maximum effort takeoff to a maximum effort landing. The runway gradient remained the same—up to 12 percent. Maximum effort landing procedures and airspeed were briefed and used. The crew indicated that the aircraft experienced an unexpected increased sink rate after crossing the threshold and the touchdown was evaluated as "firm" but not "hard." No one examined the aircraft for damage and the crew prepared for takeoff. When passing the end of the runway after liftoff, the crew noticed a small piece of sheet metal on the runway and site operations determined that it had come from the C-130.

Chapter one of this saga was classified as a Class "C" incident; substantial structural damage in chapter two made it a Class "B" mishap. LET'S NOT WRITE CHAPTER THREE AS A CLASS "A" MISHAP!—Maj John D. Woodruff, Directorate of Aerospace Safety. ★



LOSS
CONSCIOUSNES
During Air Comb
Maneuveri

MAJOR JAMES E. WHINNERY, P
MAJOR ROBERT M. SHAFFSTA
SIDNEY D. LEVERETT J

Crew Technology Division, Biodynamic
USAF School of Aerospace M
Brooks

The authors state that during a high-G maneuver a pilot m consciousness for several seconds. Can this account for the loss o of our high performance aircraft and

Loss of consciousness (LOC) can be induced in aircrewmen when their G tolerance is exceeded. This is true even with all the additional benefits of new anti-G suits, protective M-1 and L-1 straining maneuvers, and tilt back seats. The higher the G load the more likely it is that a pilot will be in an acceleratory range which exceeds his individual G tolerance. With more operational high performance aircrews, especially those flying the F-15 with its high-G onset rate (as great as 10 G/sec), we can anticipate a greater likelihood of LOC during aerial combat maneuvers. The danger of LOC is not limited to the F-15 since a variety of other aircraft can achieve a high enough G level to exceed the average pilot's tolerance.

These levels of increased G forces applied on aviators in modern high performance fighter aircraft are no longer airframe limited but instead are limited to the ability of the body to withstand the excess G Acutely, the G-limiting sy constitute a spectrum of de sensorium ranging from through blackout to a final los sciousness. The threshold f of greyout, blackout, and L variable and are influenced by of onset of G, duration of G, G experience, heart rate pressure along with other a

The induction of these G-
symptoms is considered to
dary to a progressive cir-
decrease in the blood sup-
retina and brain during in-

Crew Technology Division
SAF School of Aerospace
(USAFSAM), we routinely
viduals to various levels
on a human centrifuge.
undergo G-stress ex-

posures include the officers and airmen of the USAFSAM human acceleration research panel, USAF aircrewmen undergoing medical evaluation and students in various USAFSAM aeromedical courses undergoing high-G orientation. Although every effort is made to prevent LOC, its insidious onset makes an occasional episode inevitable. These G exposures are routinely videotaped for future reference and "instant replay." Several episodes of G-induced LOC were recently reviewed on the subjects who had ridden the USAFSAM centrifuge since 1976 and suffered LOC. The time of incapacitation was measured during the LOC episodes as recorded on videotape. The time of incapacitation is defined as the interval that begins when a subject is unable to respond visually or verbally to any stimulus to the

LOSS OF CONSCIOUSNESS continued

moment when he has return of either of these functions.

Our results indicated that the overall mean time of incapacitation of subjects who experienced LOC during centrifugation was 15.0 sec with a range from 9.0 to 20.5 sec. The time of incapacitation appears to fall within this range regardless of the G level, the onset rate, the characteristics of the subject or the previous G experience of the subject.

For most acceleration exposures there is theoretically a finite time between complete blackout and LOC; therefore, it is possible to have complete loss of vision and still remain conscious. However, we have observed many instances during a rapid G onset run in which blackout and LOC occur simultaneously. The average time from peripheral light loss to LOC has been found to be around 1.7 sec. Previous documentation of G-tolerance limits has shown (during centrifuge experimentation) that peripheral light loss (greyout) occurs between 0.6 and 1.0 G before blackout, with blackout preceding LOC by 0.5 to 1.0 G; and from greyout to LOC there must be an increase of 1.0 to 2.0 G. Consequently, the likelihood of experiencing a loss of consciousness episode should increase with increasing G level.

Whether or not a pilot going through a high-G aerial combat maneuver (ACM) and undergoing LOC will fortuitously be able to return to a low-G environment with subsequent rapid recovery is a complex question and depends on several factors. In addition, whether or not immediate aircraft recovery would be possible upon return of consciousness is not known. Our results indicate the LOC induced by isolated increased G-stress induces a mean incapacitation time of 15 sec. This represents the lower limit for the time of incapacitation since during the centrifuge exposure the subject is returned immediately to +1.0 GZ at the first sign of incapacitation. A pilot flying an aircraft would probably experience a longer time, depending on the rate of decrease in G forces and the amount of time required to gain aircraft control after regaining consciousness and overcoming the attendant disorientation and conf

The most important finding in observations on our subjects a AFSAM was that an episode induced LOC may not be recog by the subject. Several of our sul including aircrew members, d believe they had undergone until instant replay review videotape recording. Consequ it is possible that a pilot in a performance aircraft who loses sciousness may be unaware tha thing had occurred, with subs failure to report such an unwit event. No significant residual toms other than transient an and confusion were manifest of the subjects. Some subjec experience a tingling sensation extremities post LOC.

Even 15 sec of uncontrolled in a high-performance aircraft a very long time in which the can travel great distances. without saying that there is amount of danger present whe occurs in a high-performance a It is therefore beneficial for crewmen, especially those wh be regularly exposed to a high vironment, to have a healthy for G-induced LOC and to ha most up-to-date information an ing on methods to protect the LOC. ★

GROUP GROPE 5

The Combat Pilots Assn Group Grope 5 will be held 27-29 October 1978 at Shangri-La, Route 3, Afton, Oklahoma 74331. For additional info call one of the following numbers: 918-742-8693, 213-822-1755, 713-721-6375. ★

TATES AIR FORCE

Well Done Award

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Prevention
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MAJOR

Richard G. Rose

162d Tactical Fighter Training Group (ANG)
Tucson, Arizona

On 11 April 1978, Major Rose was number three in a flight of three A-7D aircraft flying a training mission. The mission was uneventful until Major Rose extended the gear on downwind during the VFR overhead traffic pattern. The right main gear indicated an unsafe condition. Mobile control and a chase aircraft confirmed that the main gear was up and locked and the gear doors were open. The landing gear handle was stuck in the down position and all attempts to jiggle the handle, and/or recycle the gear proved futile. The emergency gear extension system was activated but the right main gear still remained up and locked. The aircraft was porpoised and yawed in an attempt to loosen the linkage and allow the gear to extend, to no avail. A conference call to factory representatives confirmed there was no other known method to extend the gear. Major Rose decided to make an approach end barrier engagement. As the aircraft touched down 500 feet short of the barrier, the right wing started to drop but was flown back up with the residual air flow. A successful engagement was made as the aircraft decelerated in a right hand turn as the right wing tip contacted the runway. Major Rose's successful landing of the aircraft resulted in a minimum amount of damage. His superior airmanship and prompt actions saved a valuable aircraft and averted possible injury or loss of life. WELL DONE! ★

Anatom Of Misha Investigatio

YOU ARE THE RECOR

CAPTAIN JAMES J. LAWRENCE • Directorate of Aerospace

THE PRELIMINARIES

The rotors of the camouflaged CH-53 helicopter slowly wind down. The crew chief gives an all clear sign and a group of despondent officers and enlisted men cautiously approach the awaiting air machine. These are not happy people. Their mission is the first cog in the machinery known as a mishap investigation.

The group is called an Interim Safety Investigation Board. Their goal is to secure the mishap site, gather applicable evidence, send out initial notification reports and generally make ready for the Formal Board, convened by the MAJCOM or numbered Air Force authority. The destination is a tactical target range where the wreckage of an Air Force fighter is resting. A black scarred length of ground slowly becomes visible as the CH-53 nears its destination. The interim board begins to pick up the path of the wreckage pattern. The earth is littered with the remains of aircraft components. Security police are already on the scene to divert the curious.

A crew member is dead. His body rests close to the ejection seat some distance from the initial impact point. The interim board can find no evidence of an ejection attempt. No time to ponder possibilities now. There is work to be done. The mortuary people are on the way; pictures must be taken; aircraft fluid samples must be gathered; ordnance must be accounted for; classified equipment has to be l
measurements need to be take
ponents must be identified and
on a wreckage diagram. Back
base, flight and personnel reco
be gathered; maintenance reco
pounded; an 8-hour message se
ness statements taken. These a
people.

THE INVESTIGATION BOARD

Members of the safety direc
the Air Force Inspection and
Center (AFISC) have receive
notification of the mishap. De
sketchy. They know only the
type and that there is a fatalit
indications are that this acciden
the criteria for which AFISC

ed in the Professional Military Investigation (PMI) Program.

MI is a test. The theory is that an rienced group of people with sev- mishap investigations under their can do the job more efficiently. fully, such a team can more pre- identify root causes and develop mendations that will prevent a rence. AFISC committed itself to uch investigations during the test . Convening authority still resides he MAJCOM, and AFISC goes ly by invitation. Four of the five been completed. This one could e the fifth.

PMI team is placed on stand by ntacts with the MAJCOM safety are initiated. The AFISC team s of a Board President, an Inves- Officer, a System Engineering r and a Recorder. The first three permanent corps. The fourth the slowest moving company officer. I feinted left when I have cut right and was selected teer.

ntuition held true and the invita- ne. Armed with investigation e team departed Southern ia. Arrival at the base of the occurred the next morning, less hours after the crash.

VESTIGATION

st impulse upon arrival was to ht into the investigation effort. perienced heads, however, d me to cool my heels. Or- n is the name of the game, and falls into the hands of the re- The first step is to bring the date with the progress of the oard.

vestigation board was not yet Life support and life sci- mbers were supplied locally ot and maintenance members ing in from another base and due until that evening. The then would not commence rrow. That left the afternoon ng and coordinating. The SC members build the plan nation is the forte of the re-

The first step is office space, and not just a cubbyhole, but a large work area. Room is needed for the board members, eight in this case, and for any technical representatives that might be invited in. Aside from desks, you need a file cabinet, work tables, chalk boards, bulletin boards, supplies, typewriters, and a good deal of administrative assistance in the form of typists. The base safety office is your initial contact for procuring these items. Look for a person with a lot of stripes and a few years on station. That person will possess the contacts that will be needed to help you function as a recorder. If you find such a person, he or she will be an invaluable asset, as you poke around a strange base.

That first day is well spent, if you can manage to make initial contact with those agencies that you will depend on most during the investigation, e.g., the photo lab, base reproduction, base supply, and graphics. Talk with the head man. Explain your purpose and what support you expect to need. Discuss priorities and be sympathetic to his other work demands, but firm in your own requirements. A little human relations goes a long way.

The investigation began the next day with the field effort. The team was airlifted to the wreckage site. The first step was to make a walk-through of the entire wreckage pattern. The team didn't linger on any one component but just tried to get a feel for the entire scene. After that initial contact, the exercise was repeated, but in greater detail. Here they tried to identify components and establish the sequence of wreckage breakup.

At this point, the goal of the investigators is to concentrate on the HOW aspects of the accident and leave the WHYS for later analysis. The task at hand is evidence and data gathering. The board needs to determine the flight path of the mishap aircraft, the glide path and airspeed at impact. They looked for signs of yaw, bank, FOD or birdstrike; compared impact marks to previously measured dimensions of the aircraft; located the engines and flight control actuators.

Probably the most important activity during this first day is to determine what technical assistance the board will require. You determine this by deciding on what questions need answers. Were the engines running prior to impact? If so, at what power setting? Were the flight controls operating properly? Was the pilot over-tasked with a combination of mission and system requirements? Once you determine the questions that need answering, the next step is to call AFISC for help in answering those that are beyond the board members' capability. The Policy and Programs Division people have contacts with the ALC's and contractors for needed expertise and they will handle the details of arranging support.

Our investigation revealed the need for engine and hydraulics specialists, an aircraft manufacturer's representative, and a human factors specialist. They were on scene in less than 24 hours after we called in the request. It also appeared that valuable evidence could be uncovered by sending the instruments to the ALC for impact analysis and by taking the actuators to their manufacturer for teardown and analysis. Company aero engineers worked on maneuverability parameters.

As the investigation progresses, it's easy for the recorder to become engros-

Anatomy of a Mishap Investigation continued

sed in his administrative functions and lose contact with the progress of the investigation. Beware of this happening; don't let it happen. Force yourself to get and stay involved in the investigative process. This knowledge will make your job much simpler from a communication standpoint, for you are the focal point for communications, and from the standpoint of setting your priorities for accomplishment of support tasks. Additionally, this will ensure you personally learn from the experience and not just hone your administrative skills.

The field effort progressed. Selected components were airlifted in for further study. Engines had to be trucked from the accident site for local teardown by the engine specialists. Maintenance work areas had to be arranged for. The team decided that there was no need to bringing in the wreckage for reconstruction, a common action by investigation boards. All that had to be learned could be gleaned at the mishap site. In three days the field work was complete.

THE ANALYSIS

Once the evidence from the field is complete, the real search for the WHYS begins. Each member of the board must now study all factors that bear on his area of expertise. The pilot member dug into the personnel and flight records. He also studied flight manuals, phase manuals, and training records. The pilot member must be a current flyer in the mishap-type aircraft and his familiarity with equipment and mission is important to the investigation.

The maintenance member is also an expert in the aircraft involved. He oversees all local teardown efforts. Life Sciences is filled by a flight surgeon and life support by an equipment specialist. Each man must cover every aspect of the investigation in their specialty. The investigatigating officer is the board's chief of staff. He directs the effort and keeps the members moving in the desired direction. The president determines policy and manages the entire effort. The recorder gets headaches, for he assists each member in the accomplishment of their duties and is the repository for all they uncover.

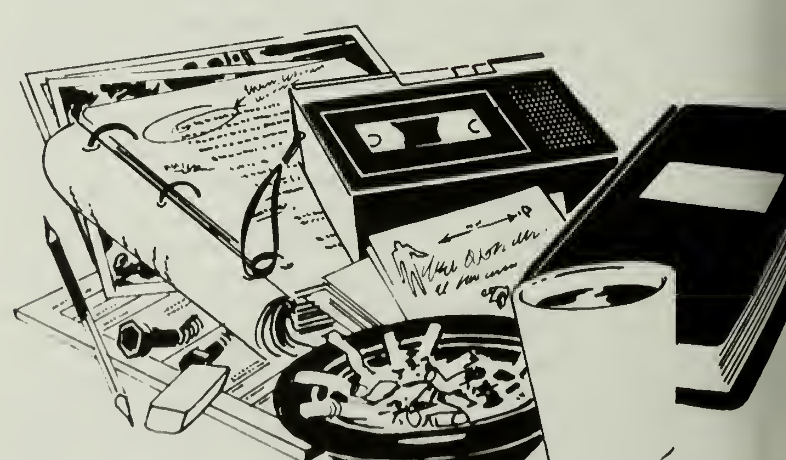
Although each member is pursuing his own area, the total effort should be moving in one direction. This goal is accomplished by having team meetings every day. Each member briefs the group on his efforts and findings. Priorities change on a daily basis and the players have to be informed. Communication is a key to success. What one person may know could be the information another needs to answer his questions or solve his problem.

TDR results were coming in and the team members were busy completing the AF 711 series forms required by AFR 127-4. The recorder must keep track of all the evidence, reports, and forms being worked. I suggest you use a three-drawer filing cabinet system.

Set up each drawer with a sect
every TAB to be used in the
report. Use drawer 1 for materia
worked and supporting ev
documents. Use drawer 2 fo
pleted material: AF 711 docu
typed statements by witnesse
down reports and other data ne
the formal report. Use the last
for material you have reproduce
awaiting compiling and insertio
formal document.

Some other helpful hints for
corder. Keep a telephone log of
ing calls and track follow-on
required and accomplished. Set
production log to record the c
and goings of material to be dup
Use some type of message b
relay information to other boar
bers. Keep a file of all correspo
and messages received or initi
the board.

Another major aspect of this
the interview of witnesses. Te
usually appears verbatim in the
report. Again, this is the re
problem. Two methods are a
You can tape the proceedin
have them typed using a tran
machine, or you can use a court



. The latter is the preferred
, but a court stenographer may
icult to obtain. Support must be
d in advance. The board mem-
ould prepare proposed questions
the interviews. Make sure the
s understands the privileged
of his testimony and the differ-
tween a safety investigation and
dent investigation. The safety
gation is solely for mishap pre-
purposes, whereas the accident
gation is conducted per AFR
to provide factual data for other
s.

OAL

eason for the entire investiga-
nes next. That is the formula-
ne findings, causes and recom-
ons. Everything done so far has
upport this function. The total
worthless unless the root
an be identified and actions are
which will prevent future
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What can be done?, and at
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ort.
ctivity unfolds, the recorder
sy with the demands of the
ping support really comes
now and reproduction is a constant concern. As work is completed by the other members, it has to be edited, proofed, drafted, coordinated, finalized, then duplicated. These are perhaps your busiest times. Expect long hours, frustration and pressure from several sources.

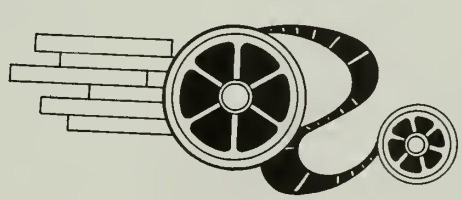
The remaining board duties are predominantly clean-up in nature. When all material is reproduced, the reports must be put together and mailed out. Briefings, with appropriate visual aids, are usually required for the convening authority. Thank you letters to those who assisted you should be prepared for the board president's signature. Expect last minute changes, keep a positive attitude and do your best.

In reflecting on my experiences as a recorder, I have mixed emotions. On the negative side, there is a lot of errand running and go-foring. Menial as well as meaningful tasks become your daily concern. But like most bitter pills to swallow, the end value is worthwhile:

First — you are participating in an apparatus that has noble goals: the saving of future lives and resources.

Second — you have the opportunity to exercise your talents in organization, control, coordination, communication and human relations. All the things the college and PME textbooks talk about as the axioms of management and

Third — you get a better understanding of the impact of the safety attitude in the daily execution of your assigned duties, no matter what they are. The investigative process is exacting and challenging; and well worth your time as an observer and participant. If you get the call, approach it as you would any valuable experience in your chosen career. ★



MIDAIR COLLISION FILM

Just released! AFISC, through the production facilities of AAVS, has just completed a videotape show on a recent A-7 midair collision.

This show details the how and why of the events leading up to the mishap.

This 12-minute show, in living color, is just the attention grabber for any unit meeting. Supervisors will love it because it gets across some points difficult to handle otherwise. Pilots will love it because it points out some fatal mistakes to be avoided. Commanders will love it because it might save some lives, equipment and the mission.

To get a copy on loan, free of charge, go to your base film library and ask them to order VC3 AVR 214, A-7 MIDAIR COLLISION BRIEFING.

Printing Office: 1978—783—114/1

aerospace

SAFETY DECEMBER 1978

The Christmas—New Year holiday season is traditionally a time of happiness, well-wishing and dedication to doing better in the coming year. The season brings out the best in people and produces warm feelings toward each other that are not so evident during other parts of the year. In the Air Force, however, we have to have this feeling of compassion and empathy year round. The loss of a life or an aircraft affects us all, and we cannot afford an attitude of indifference or complacency. "Accidents will happen" cannot be part of our thinking.

We have done an excellent job this past year in maintaining our combat readiness posture with a continuing low mishap rate. However, there has been an increase in certain types of mishaps—a trend that must be reversed while maintaining the intensity of our training. This will require the dedication of each person in the Air Force to doing his job just a little better, a bit smarter, a little more thoroughly and with a lot of common sense. The rewards, I am confident, will more than offset the extra effort.

We in the Directorate of Aerospace Safety wish you a Merry Christmas and a great 1979. All of us working our mission together can make the New Year superb and safe. ★

Garry A. Willard, Jr.

GARRY A. WILLARD, JR.
Brigadier General, USAF
Director of Aerospace Safety

UNITED STATES AIR FORCE

DECEMBER 1978

aerospace SAFETY

AFRP 127-2
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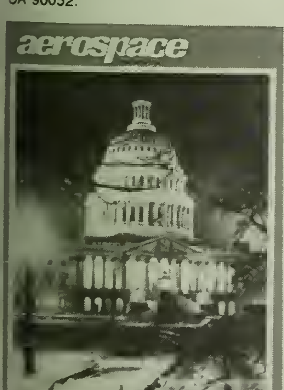

Cover: Seasons Greetings

SPECIAL FEATURES

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page 16

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

DECEMBER 1978 AFRP-127-2 VOLUME 34 NUMBER 12

EYEBALLS OUT

See and avoid

Have you had your NMAC (near midair collision) today? Or, a real midair?

Do you know whether you've had either one?

You may think the latter question rather foolish, but the fact is that many NMACs occur daily with one or both crews oblivious to the fact. It's also true that you can have a midair collision and never know it. Until the damage is discovered on the ground, that is.

Whether there are more NMACs, or they're being reported more conscientiously, or our pilots are just more alert, we don't know for sure. It is a possibility, however, that despite all our modern equipment for traffic control, we may be having more NMACs simply because of traffic volume.

Within a period of about
prior to this writing, the fol
incidents occurred, and they
the total, just some of those
In each case there was some
that made the event possible
nearly every case it was an
Force pilot who prevented a
midair.

• T-38 — Pilot saw civilia
at 11 o'clock and took evas

action. Miss distance estimated at 100 feet. T-38 pilot was issued several advisories that traffic was squawking 1200 at T-38's 12:30 to 1:00 o'clock position prior to the pilot seeing the light plane. The civilian pilot did not see the T-38 until after it had taken evasive action. A factor was that the T-38 was on UHF while the light plane was on unicom.

• T-38—Aircraft was on a PAR downwind when traffic called 12 o'clock, one mile. Pilot saw a head-on collision course and turned hard left. He estimated miss distance as 400-500 feet. It was believed that the pilot of the other aircraft never saw the T-38. A possible factor is that the small frontal profile of the T-38 with its white paint and high speed is hard to see.

• T-37—Pilot saw a Cessna 172 approaching head-on and took evasive action. Radar was not painting any VFR traffic and stated that without a transponder they probably would not paint a primary return.

• T-37—As the aircraft was passing 3,500 feet on departure, traffic was called at 11 o'clock, one mile. The pilot took control from the copilot and turned to avoid a midair collision. Miss distance was estimated at 300 feet horizontal. Both aircraft were operating properly. See and avoid by the T-37 crew plus departure's traffic advisory probably averted an accident.

• T-37—IP looked to his right and saw a civilian twin approximately 200 feet away on a collision course. An immediate dive averted a collision. Other aircraft took no action. Miss distance was about 50 feet. Approach control was painting five aircraft but not on a potential collision course. The light twin was never identified.

• B-52—Aircraft was making a penetration turn. Passing 11,000 feet the crew saw a low wing, single engine, white aircraft at their 11 o'clock. At 7,500 feet MSL, both aircraft took evasive action, coming within 200-300 feet of each other. Approach Control equipment was operating normally but did not receive a radar return, IFF/SIF code, altitude readout or transmission from the Comanche.

• B-52—At 10 miles on PAR final the crew was given an advisory of an unidentified aircraft at three miles, 12 o'clock. The controller continued advisories and the B-52 crew sighted the traffic at one-half mile. A straight-ahead-climb averted a collision. The area is a busy one for aircraft, with a high midair collision potential. The wing has an active collision avoidance program with pamphlets and slide briefings for military and local civilian pilots.

• F-111—The crew saw the other aircraft too late to take evasive action. Fortunately, the other aircraft passed over with approximately 100 feet separation. The F-111 was under radar control; no flight plan was on file for the other aircraft and it had no contact with the controlling agency. Contributing to this incident was the IFR/VFR traffic mix with no designated altitude separation (below 3,000 feet).

• UH-1—The helicopter was on final approach when the scanner saw an A-10 closing rapidly. He advised the pilot to break hard right. The A-10 passed within approximately 200 feet.

So much for several NMACs. How about a MAC (the real thing). These folks had to be the luckiest people around at that particular time. A T-37 and a light twin collided with both recovering safely with no injuries. The T-37 IP heard a "bang" and the right engine fire/overheat warning light illuminated accompanied by an EGT rise and rpm winding down. He made an emergency landing without knowing the aircraft had collided with another. The light twin also recovered safely.

These and other unreported NMACs are telling us several things: There is a big midair collision potential; VFR and IFR traffic do not mix too well; while many civilian light planes have and operate transponders, many do not; those without transponders frequently do not show up on radar; "See and Avoid" is not good enough.

This does not mean the situation is hopeless. There is no question that many potential midairs are prevented by aircraft of all segments of aviation having identification equipment (transponders, altitude encoding equipment, strobe lights). Radar traffic advisories and ARTS III provide better utilization of the airspace with increased safety. The FAA is working on collision avoidance systems, particularly the *Discreet Address Beacon System* (DABS). The Hazardous Air Traffic Report (HATR) is helping identify the potential—be sure to report your NMAC. Meanwhile, we must do the best we can with what we've got. Funny thing about articles on midair collision prevention: the bottom line is always the same. Eyeballs out—SEE AND AVOID. ★

American aviation, its fine safety record notwithstanding, still records mishaps which take the form of aircraft being literally flown into the ground. In fact, this type of tragedy has occurred with such regularity that the descriptive term "controlled-flight-into-terrain" (CFIT) is used to narrate the sequence of events leading to a mishap.

"A normal flight regime . . . no significant emergencies and no warning to the crew or controlling agencies of impending trouble . . . the aircraft impacts the terrain at some place other than the runway." This is a rather loose recital but it serves to illustrate the nature of these mishaps which leave safety experts with puzzled looks. How widespread are CFIT mishaps? Let's look at a few examples.

- At a Northern US base a strategic bomber, flying a night instrument approach in weather, crashes 3½ miles short of the runway – 11 fatalities. Investigators find no evidence of mechanical malfunction.
- A 4-engine transport, on radar vectors to destination base, crashes into the mountains in the Northwest. Sixteen people perish in the mishap. The aircrew accepted and flew a descent clearance that did not ensure adequate terrain clearance.
- A commercial plane, inbound to Dulles Airport near Washington, DC strikes a mountain after prematurely descending below safe enroute altitude. The report mentions communications confusion as a factor in the mishap.

CFIT mishaps – on the surface at least – appear to be preventable. The problem is to find the key. The list of proposed and initiated fixes is impressive: Radar altimeters, terrain alerting systems, coupled approaches, ground proximit ing system, etc. While the of fixes can provide a partial the distinct human element CFIT mishap makes it ex unlikely that hardware w universal cure-all. Since t accident is a uniquely hum lem, the appropriate place our search is with people.

Rather than make an ex listing of aviation huma problems – which clearly ex scope and purpose of this let's examine one aspect of people problem: Crew coor

When we use the term " ordination" we are describi tem that we hope will pr with human redundancy. In 25 years mishap rates hav a sharp decline in all but The percentage of mishaps a to the aircrew. Statistics

Crew Coordination

Major Roger L. Jacks
Directorate of Aerospace Safety

derscore this point. From 1966 1975, one billion dollars were lost flight mishaps where human error s cited as causal. Further anals indicates aircrews traditionally ise approximately 40 percent of flight mishaps.

Perhaps a definition of crew coination is the way to begin this cussion: "Crew coordination can defined as the atmosphere which ilts when a team of capable iniduals combine their talents into nified, finely-tuned effort. They this in such a manner that they alert to the first signal of poial trouble." If we agree that this n acceptable definition of good v coordination, then failing "to eve an atmosphere which is conive to the fine-tuned effort" d be a definition of poor crew rdination. In the remaining graphs we'll take a closer look at those things that make or break good crew coordination.

Vigilance may be defined as a watchfulness or attentiveness to potential danger. Viewed in this light, more safety advocates would agree that a vigilant attitude is a desirable element in an aircraft cockpit. However, when vigilance is distorted by misplaced confidence, it can be self-defeating. For example, if crew members are reluctant to question the performance of the aircraft commander, then flight safety may be compromised and crew coordination may be defeated. Can this happen? The bomber mishap referenced above provides a positive answer.

As I stated earlier, the mishap occurred when the aircraft crashed 3½ miles short of the runway during a night instrument approach. The safety investigation board found no evidence of material failure; the bomber was apparently flown into the ground. This particular aircraft carries a six-man crew: Two pilots, two navigators, a defensive systems operator and a gunner. Four of the crew members – the pilots and navigators – should be directly involved in aircraft positioning and control, especially during the descent and landing phase of flight. The aircraft had sophisticated equipment on board which could have been used to determine the precise distance to the airfield. If the navigation team had used this equipment properly, they would have known that – at a point 3½ miles from touchdown, (the impact site) – the aircraft should have been at least 1,000 feet above the ground. This information relayed to the pilot team in time could have averted the disaster. Obviously, it was not.

Crew Coordination continued

The bomber navigation team assumes a significant responsibility for aircraft positioning during all flight phases. However, for a multitude of reasons, the navigation team – at least at the time of the mishap under discussion – did not play an aggressive role during the descent and landing phase. Why? Is it overconfidence in the airmanship of the pilot team? Or, is there a seniority barrier which restricts free and open communication? Whatever the reason, crew coordination failed and flight safety was compromised. Of course, this same type of problem can occur in the cockpit of any aircraft.

For example, an aircraft is making a nonprecision approach to a strange field in the weather. As the aircraft passes the final approach fix, the crew is advised that a snowstorm is moving across the approach end of the runway. The correct altitude calls are made as the aircraft penetrates the snow. A crew member assumes the aircraft will be leveled off at MDA if the runway is not in sight. But the descent continues through the MDA, some trees are struck, a go-around is made and a subsequent uneventful landing is made at another field.

This is an example of capable individuals failing to combine their talents into a unified crew effort. Something was amiss in the cockpit atmosphere. There may have been several factors present that caused the poor crew coordination. For example, the manner in which command was exercised and accepted could have adversely affected crew cooperation, mutual respect and perceptions of responsibility. An improper cockpit atmosphere could have bred such things as misplaced confidences, seniority/experience barriers and timid crew members. In the case of this crew, one or more of these factors had produced a cockpit atmosphere best described as: "A group of individuals who happen to be traveling to the same destination in the same cockpit."

All of us are subject to human failures, but we can reduce the frequency of these failures. Integration of flight crew activities can most certainly give us error protection through human redundancy. Crew coordination is the basic building block to mission success. Let's look at some benefits to be derived from good crew coordination.

- Each crew member is informed on all aspects of the mission.
- Each is thoroughly familiar with the "plan of attack" for accomplishing the mission.
- Crew members have no unresolved questions about their duties during any part of the mission.
- Each crew member is proficient in his crew duties including all normal and emergency procedures. He is knowledgeable and feels confident he can do his share in accomplishing the crew mission.
- The crew, through proper coordination, has ensured the required mission materials are on board the aircraft; i.e., flight pubs, flight plans, maps, letdown books and mission paperwor
- Each crew member tains a constant vi of aircraft systems a craft activities.
- An effective comm tion system exists crew members that valuable informatio timely manner.
- The crew has a sys cross-checks to ensu ical events are monit as many crew mem possible.
- Crew members giv other positive feedb mission activities. are handed out wh job is well done an structive criticism is when crew perform less than desirable.
- The crew strives f promotes espirit de They support each o the ground and in th on the job and off the

Crew coordination, it can the difference between missi cess and mission failure. It se the really good crew from t diocre crew; and as past m have proven, it can be the dif between life and death. ★

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THERE IS A WAY

Annually the Air Force recognizes a given number of individuals, units and commands for outstanding performance in safety. However, competition is keen and not all win major awards. To recognize all of those, AEROSPACE SAFETY is featuring one or more in each edition. In this way we can all share in recognizing their fine performance and, perhaps, learn some valuable lessons.

Nominated for the Colombian Trophy

84 Fighter Interceptor Squadron (ADCOM)

The 84 Fighter Interceptor Squadron at Castle AFB, CA, flies F-106s and T-33s. Last year it flew 6,794 urs, bringing the squadron total accident-free flying hours to 34,800.

1977 was a busy year for the 84th, with nine deployments, five of which involved dissimilar Air Combat Tactics with Tactical Air Command forces. nese required 394 sorties. Exercises included "Jack ost 1977" and "Red Flag" operations. In addition, e squadron participated in 24 exercises directed by er headquarters while maintaining four aircraft and crews on full time alert.

Among the problems overcome by the 84th were operation of a fleet of aircraft with both tape and d instrument systems, and dense fog characteristic of the winter months in the San Joaquin Valley. In reaching 64 months of accident-free flying, the 4 FIS made a significant contribution to Air Force Readiness during 1977.

302 Special Operations Squadron (AFRES)

Sixty lives saved over five years and 19,000 accident-free flying hours add up to quite a record.

Those accomplishments are owned by the 302 Special Operations Squadron, Luke AFB, AZ, whose primary mission is Special Air Warfare (SAW). The SAW mission includes support of counterinsurgency, unconventional warfare, and psychological operations.

Tasks include aeromedical evacuation, airborne command post, air strike and control, combat air rescue, visual and photo reconnaissance, and support of Army and Navy special forces units. The squadron aircraft is the CH-3E helicopter.

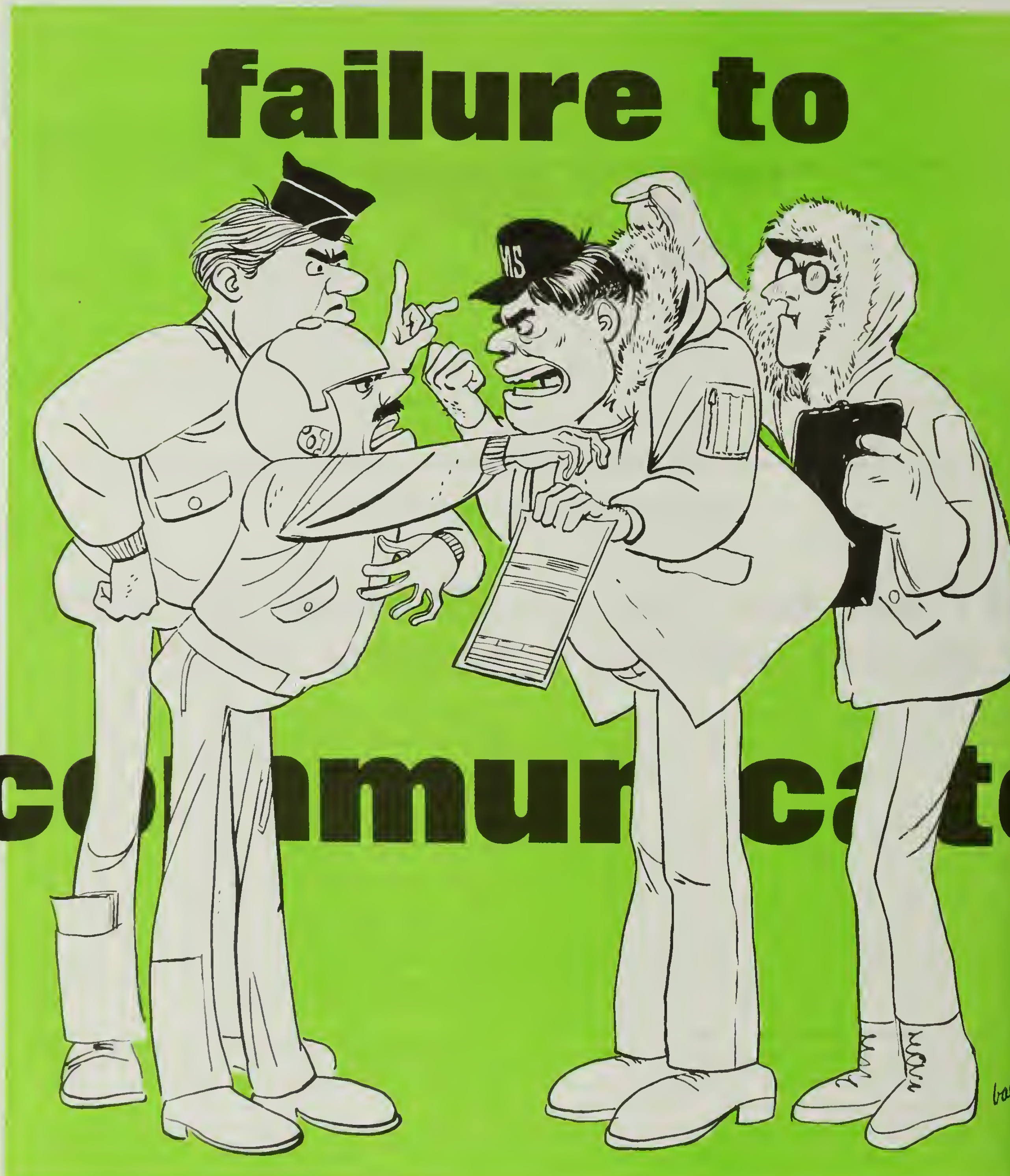
Operations often call for low level navigation (100 feet AGL), missions in mountainous terrain, flying into unprepared landing zones, and overwater flights.

Accident prevention efforts include review of the flying schedule personally by the DO, who also flies with every pilot and mechanic on a regular basis.

Crew chiefs fly with their aircraft. The standardization program is based on the concept that the more proficient a crewmember is, the more safe.

From 1968 through 1977 the unit went through two aircraft conversions while accumulating 19,000 accident-free hours – an outstanding accomplishment. ★

failure to communicat



A recent aircraft mishap points out the need for better communication between the ops and maintenance folks. The mishap involved structural damage to the aircraft's variable air inlet system and subsequent foreign object damage to the engine as th result of overpressures associated with violent compressor stalls.

In this case, both mainter and operations personnel m some errors over an extend period which allowed damaj

When the measure of successful maintenance of your aircraft depends on good communications, is there any extra effort you can make that isn't worth it?

lajor Cleveland Simpson
irector of Aerospace Safety

om the compressor stalls to go ndetected and progress to timate failure of inlet structural omponents. Specifically, perations supervisors failed to pecify which engine bnormalities required pilot write-ps and ensure that the write-ups ere detailed enough to generate ppropriate maintenance action. s a result, pilots wrote up the rcraft for engine stagnation/ terburner blowout when, in fact, e aircraft had experienced mpressor stalls.

Compounding the problem s the fact that since the entries the aircraft forms dealt only h engine stagnation/afterburner wout, maintenance personnel not accomplish an in-depth ake inspection because sting tech data did not require f, however, the discrepancies d been written up as npressor stalls, a detailed pection would have been uired by tech data and the nulative damage which had urred during the past several nts could have been covered.

Maintenance personnel, on other hand, could not be npletely exonerated, since it eared they were less than lous in getting to the root of the problem after repeated write-ups. Besides not pressing the pilot for a more detailed write-up, they missed at least one opportunity to prevent the impending mishap when they previously changed the engine for FOD from an undetermined source. It is quite probable that this FOD was from initial damage/breakup of the variable inlet structure; however, failure to tie the FOD occurrence to previous stagnation/afterburner blowout incidents, or to accomplish an in-depth inspection once the source of the FOD could not be determined, allowed hidden damage to go undetected.

Although this mishap involved a little-understood phenomenon associated with newer generation, high performance aircraft, it is an extreme example of what can happen when ops and maintenance personnel fail to properly communicate on aircraft discrepancies. Operations supervisors must ensure pilot entries in the aircraft forms describe the discrepancy as clearly and concisely as possible. They also must ensure their pilots thoroughly understand the aircraft and its systems and are provided with specific procedures for making accurate analyses of problems as they occur. Granted, pilots cannot always be expected to make the proper assessment, considering the complexities of modern aircraft systems and the rapidity with which failures can occur. This is partly the reason why airborne recording/ diagnostics systems have been included on certain aircraft or are under development for others. However, until these systems are put into widespread use, maintenance debriefing takes on added importance as a forum for direct communications between operations and maintenance personnel. In addition to apprising maintenance personnel of the circumstances associated with routine discrepancies, pilots must make full use of the available technicians/specialists to assist them in making accurate entries regarding discrepancies which they may not fully understand.

For their part, maintenance personnel must make an earnest effort to assist the pilot and correctly discern the nature of the problem which the pilot is attempting to report. When it becomes obvious that the write-up does not contain enough information concerning a particular problem, an in-depth investigation must be made—including further discussions with the pilot, if necessary. Only then can we avoid future mishaps such as the one described above. ★

PROFESSIONALISM

Most of us think of ourselves as professionals regardless of what we do. However, each of us can probably think of unprofessional things we have done – things which we are not too proud of – unprofessional things.

True professionalism seems to stem from a combination of contributing factors. Knowledge or education forms the base for any professional. Not just the basic knowledge, but the advanced courses, specialized courses, dedicated self-study and professional reading. The professional pilot needs to continue his studies after UPT and RTU/CCTU/TTU. IP courses, advanced aerodynamics courses, Air Ground Warfare courses and seminars on new techniques and procedures are the equivalent of medical specialization and continuing education for a doctor. The truly professional pilot also reads more publications than just *Aerospace Safety* and *TAC Attack*. *Aviation Week*, *Interavia*, FAA and NTSB reports, and reports of the American Institute of Aeronautics and Astronautics are just a few of the professional aviator's trade journals. Continued learning is a never-ending goal of a true professional.

Experience is another essential element of professionalism. A doctor cannot practice medicine until serving a period of internship followi education. Likewise, a plumbe not be licensed without a per apprenticeship. It would be na believe that a pilot could be professional without a seas period under close supervisio perience is not achieved when a ride is passed or a minimum n of flight hours reached. Expe is achieved when all required can be accomplished consis well. When a fighter pilot can target consistently with his bombs, rockets and missiles, the most adverse conditions, where in the world, handle all gencies well, fly excellent forr

Lt Col Charles L. Pocock, Jr.
Directorate of Aerospace Safety

instruments to minimums and his fighting formation, he is con- ed experienced. Experience is an idual thing. To really be experi- may take two years or twenty . Some never achieve it, espe- if they don't remain dedicated cockpit.

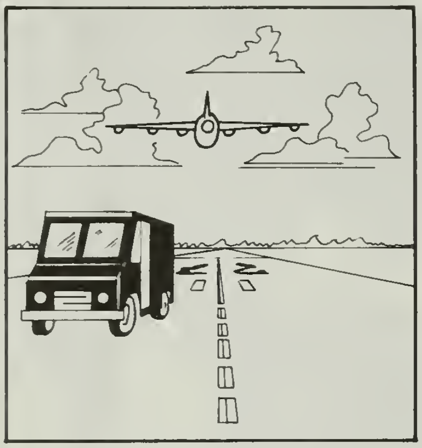
third major element of profes- ism is confidence. Confidence just self-confidence but the con- e your supervisor, operations r or commander expresses in Confidence is perhaps the first at you've "arrived" . . . the ence which others have in your s . . . confidence which allows dgment to remain unquestioned . . . and finally, the confidence of reputation which forms the basis of leadership.

A key sub-element of confidence is judgment. A professional has the ability to analyze a situation—apply knowledge tempered by experience and make a correct decision. A professional pilot exercising sound judgment can successfully maneuver his aircraft at the extremes of its performance envelope without going too far—ever. He knows not only the aircraft's limitations, but also his own limitations, and he considers all factors in his judgment. Such things as closure rates, weather conditions, reaction times and so on, are things which are automatically a part of his decision process.

The true professional knows what he can do and what he cannot do; he also knows what he should not do because the risk is too great. The true professional doesn't "take more chances" than the nonprofessional, although it may often seem that way. The real professional is just better and can do more with the same aircraft.

Professionalism is more difficult to achieve than courage and, although courage is essential, pilots noted for their professionalism seem to live a lot longer than pilots noted only for their courage. ★

OPS TOPICS



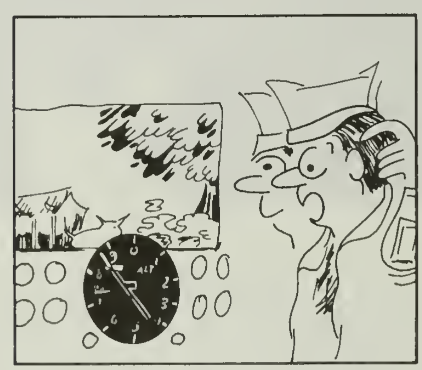
"CLEAR"ED TO LAND?

The transport had been cleared for an ILS approach and had been given clearance to land by tower. On short final the pilot saw a vehicle on the right side of the runway. The pilot leveled the aircraft and, when clear of the vehicle, he landed approximately 4,000 feet down the runway.

How did it happen? A runway change was in progress and fire department and barrier maintenance vehicles had been cleared on the runway to reconfigure the barriers. When the C-130 was at 13 miles, the ground controller (GC) called to confirm that the vehicles were clear of the runway. However, because the GC had not written down the call signs of the vehicles on the runway, he assumed he had confirmed that all vehicles cleared the runway, which was not the case. The senior controller queried the ground controller concerning any vehicles on the runway, and after the GC scanned the runway and saw no vehicles, landing clearance was issued. The GC's vision of the runway was hindered because of fog/haze and he was looking directly into the sun.

CHECK THE WATER, SIR?

A CT-39 recently experienced an engine flameout climbing through 39,000 feet. After five unsuccessful attempts at airstart, the pilot finally got a relight on the sixth try. Investigation at home base revealed significant amounts of water in the fuel system. In the opinion of the investigating officer, sufficient water was present to flame out not only one, but both of the engines! Most likely reason for the presence of the water? Failure to drain the aircraft fuel system following refueling operations or during the preflight inspection. The requirement is clearly stated in the checklists for each operation. — Sqn Ldr Peter White, RAAF, Directorate of Aerospace Safety.



PITOT STATIC ICE

After 2 + 30 hrs of flight at altitude, the pitot static system on an RC-135 malfunctioned, producing erroneous readings on both the pilot's and copilot's instruments. At 12,000 feet on descent the system returned to normal. The aircraft had been subjected to heavy rains for three consecutive days and moisture trapped in the system froze. Purging the system prior to takeoff will prevent this type mishap.

HYPOXIA INCIDENT

A recent hypoxia incident p
some reminders that all ai
should heed. The WSO in a
removed his oxygen mask
times because it was irritating h
That and a leaking canopy s
raised the cabin pressure a
caused him to become hypox
pilot, after some poor respons
the back-seater, noticed the
head was down. He immediat
him to go to 100% oxygen and
his mask, declared an emerge
descended to 10,000 feet. Th
came around quickly and had
ther trouble.

Some of the things this i
brought out are:

- Many crews apparently
really know what the cabin
gauge should read.
- Time of useful consci
(TUC) drops as cabin pressu
tude rises.
- Crews must be alert to th
sonal hypoxia symptoms.
- Use supplemental oxyge
cabin pressure exceeds 10,00
- Spend some time wit
physiological training folks n
then. Three years between c
rides is quite a while, especi
the new guys.

ERRANT PLATE HOLDER

The KC-135 was in the
flare when the approach plat
fell between the control colu
the pilot's seat. This preven
stick travel and resulted in a
touchdown, bounce and a
smooth, touchdown. Appare

OPS TOPICS

fueling drogue basket struck the
rrier cable which caused the basket
break off. If the plate holder is not
sitioned in its mount just right, it
n be easily dislodged by the pilot's
ees during rudder inputs. When
s happens, it lodges between the
at and control column. A fix
ouldn't be too difficult.

CASE OF BAD AIR

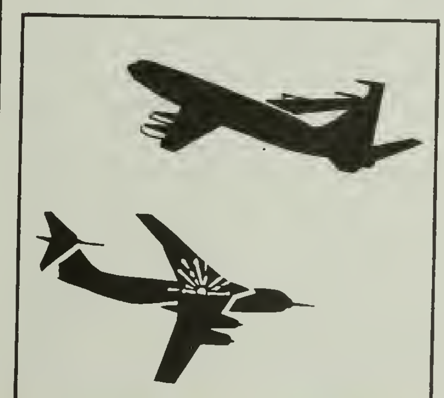
While an 0-2A crew was doing
me air work, both pilots developed
nor headaches which they attrib-
d to the high heat and humidity.
ening the air vents helped. When
y returned to base and began final
h the windows closed, their head-
es returned and they had some
rdination and concentration dif-
lties. On missed approach they
h felt groggy, tired and light-
ded. They ventilated the cabin,
lared an emergency and immedi-
y landed. Maintenance found a
e in the heater air mixture box
sed by the muffler rubbing against
box. The hole allowed engine
aust to enter the cabin. The prob-
was aggravated by a missing rear
h air window. Air drawn out
ugh the hole disrupted normal
flow and directed contaminated
into the crew's faces. Lesson:
w your symptoms.

LOSE ONE!

ircraft A was flying the Ascen-
Island – Antigua Island route
epicted on Caribbean and South
rican area chart number 1, panels
d D. Aircraft B was flying UG-2.
crew on aircraft A had trans-
ed in the blind on VHF frequency 126.9 their ETA and coordinates for crossing UG-2. Aircraft B's crew did not hear the broadcast and did not make any radio calls of their own. Since aircraft A's crew interpreted FLIP to mean that if there was no reported traffic they did not have to change altitude, they did not initiate a climb until they spotted aircraft B's rotating beacon. This put them 500 feet off altitude (FL335) when aircraft B passed in front of them at FL330.

- Both aircrews were unaware of each other's presence until the crew of aircraft A saw aircraft B's rotating beacon.
- The wording of paragraph 18 page 5-5 in FLIP allowed aircraft A's aircrew to misinterpret the requirement for climbing off altitude.

The Defense Mapping Agency Aerospace Center was contacted and will change FLIP at its next publication to clarify procedures when flying in this area. In the meantime, a NOTAM was published on 18 August 1978. It requires aircraft flying off airways in uncontrolled airspace and unable to maintain two-way radio contact with the appropriate civil agency to climb off normal flight level from 32 NM past the airways.



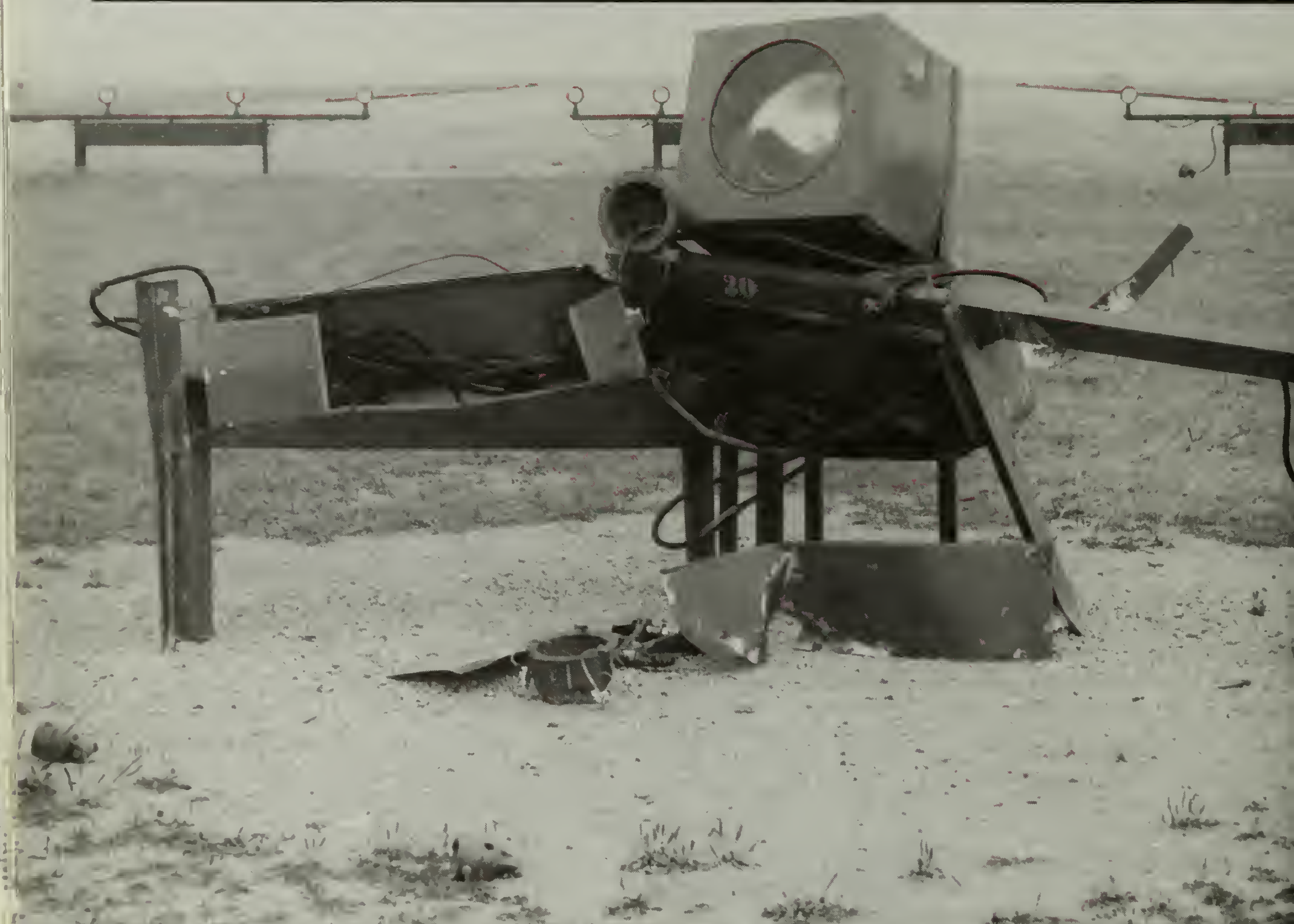
FAA TO TEST COLOR RADAR DISPLAYS

The Federal Aviation Administration is adding color to its radar scopes in a test program aimed at helping air traffic controllers distinguish between different types of information on the scopes. The test program will be conducted at the agency's air route traffic control center in Leesburg, VA.

Three colors – red, orange and yellow – will be added to the present monochromatic radar displays which show all information in green. Red will be used to depict map lines and navigational aids and orange for weather. Yellow and green will be employed for aircraft data blocks which provide controllers with the identity, altitude and other information on the flights they're handling.

The test at Leesburg is scheduled to begin in April 1979 and run for four months. The success of this effort could lead to implementation of color radar displays at all 20 air route traffic control centers. Test color displays may also be conducted in radar-equipped airport control towers. ★

NO SHORT LANDINGS



You're dreaming and imagine yourself flying from the back seat on final approach for a touch-and-go with the aircraft nearing touchdown. You feel a thump and go to immediate attention. What was that? You look left and see a light fixture flying through the air.

You take it around, leaving the gear extended, line up and land again. When you apply the brakes, the left one doesn't work; however, you manage to get stopped on the runway.

Sure enough, you knocked off two lights that stood in the overrun. Those lights are about two feet tall.

Switch now to another dream sequence. Again on final with the intention of landing 500 to 700 feet past the threshold. You're on speed, with a shallow descent, and you notice the sink increasing. You adjust the pitch and add power, but not enough. The bird touches down and hits a six-inch concrete curb with the right and left stabilators. You also take out a couple of runway lights.

Now the nightmare begins. Your fighter strikes a mound of excavated runway material 1,500 feet short of the displaced runway threshold. You're able to go around but the damage can't be assessed, so yo
—successfully.

Again, you're flying a
On formation final—y
number 2—the aircraft to
down 1,500 feet short of th
way, remains on the g
for nearly 1,000 feet a
comes airborne. You a
WSO eject—again suc
fully.

Now you're in a many m
craft. The weather is
When you reach decision
you go visual, get belo
glidepath and hit a strob
panel. You fly it out and
to an alternate where yo
with three flat tires and a

ing left gear door. The passengers give a sigh of relief.

Congratulations. You have just survived most of the short anding mishaps reported in he Air Force over a two year period, July 1976 through July 978. The total was eight, of which four were Class C, one Class B and three Class A.

Now we're not going to brag bout this record, but, considering the number of landings made within that period, we ould have done much worse. fact, we probably did a whole t better than in previous ears. Nevertheless, this is a ubject we should address.

So, you ask, why now? Good uestion. For the same reason u take your flu shots each fall. eventive medicine. So roll up ur sleeve and prepare yourlf.

There will be a short land- from time-to-time. Some g ones, too, but we'll adess that some other time. ort landings *usually* result m some faulty headwork k out there on final.

The weather's a little skosh a duck-under attempt winds with the tires laying marks he overrun.

There are some ice patches he runway, or water, or what-. The pilot figures on using e's got and plans to put it n the first 500 feet or less. know the rest.

For some reason—wind s, tight turn to final from an shoot, just plain poor judg-—the airspeed ain't what ould be and the bird sinks r than the driver thinks. mp! There go some lights, a lot of ego and, in the case, an airplane.

me short landings aren't that at all. The aircraft and round get together so far from the runway that the mishap should be categorized as a collision with the ground—a crash! These are the ½-mile and greater short landings. We haven't had one for a while but there are a lot of them in the files. For some strange reason, many of these involved big, multi-crew aircraft. You'd think at least one of the jocks would know where they were in relation to the runway.

The landing phase has always been considered the most dangerous period of flight. We don't believe this has to be so, not so long as the aircraft is healthy. With a sick bird, all bets are off. But with a good aircraft and the nav and landing aids available today, there just isn't any valid reason for a short landing.

We've had our share in the winter when the pilot reported he couldn't tell the overrun from the runway because of snow. With a properly cleared runway, lights and VASI, even one-eyed Jack ought to put it safely on the runway. And if the weather is in the weeds, there are some options better than pressing on and hoping things'll work out your way. There's nothing wrong with taking it around and even to your alternate if you don't like the looks of the situation at your destination. That's the mark of a smart pilot—not just a determined one.

One of the things we have to lick in this flying business is the expectation that when we arrive at our destination, we are going to land— *on the first attempt!* This is a well-recognized syndrome that should be dealt with once and for all. There is no stigma to *not* landing on the first attempt. In fact, only a blockhead will sit there and drive the aircraft into the ground rather than exhibit the fact that he just can't make it—without a lot of luck.

This is the December issue of *Aerospace Safety*. We sincerely hope that when next December comes up on the calendar that we can report "no short landings this year." ★

". . . He couldn't tell the overrun from the runway because of snow."

FLICK

Alias Flicke Vertigo

LCDR Jane McWilliams, MC, USN
TRAWING Six Flight Surgeon

It has been known for a lon that under certain circums grand mal (generalized) s can be induced in a small nur individuals by exposing tl flashing light. This seizur nomenon has occasionally lumped with other common of flicker (irritation, nausea ness, drowsiness, disorien under the broad label of " vertigo." Unfortunately, th vertigo has a specific mea both aviators and physicians makes the term "flicker v confusing. It is not even cert the different effects of flicker lated. When talking abo seizure effect of flicker, th it is best to use the term fli duced seizures.

There are countless wa normal flight operations ca flickering in the critical fr (1-20 flashes/sec). Having collision light on in the clou ing past a row of clouds which the sun is shining, o a single-engine prop plane rpm while facing the sun, o ing a helo in the bright a sun can all cause the flick nomenon. One hundred rpm on H-46s is 264. Multipl by three (three blades) and by 60 to convert to seconds:

NDUCED SEIZURES:

$$\frac{\text{4 rev/min x 3 flashes/rev}}{\text{sec/min}} = 13.2 \text{ flashes/sec}$$

It seems obvious that all the flight rgeon has to do is find the in-viduals who are sensitive to flicker-luced seizures and keep them off rcraft. This is easier said than ne. Since 1961, the Navy has quired a baseline EEG (elec-encephalogram or brain wave) on all student naval aviators as t of initial screening for flight ning. The test has been required student naval flight officers since 7 and student flight surgeons e 1971. Since 1967, these EEGs e also been recorded during tic stimulation (flashing lights), those showing abnormal brain e response were eliminated training. A check of the Safety er's files, however, reveals at two cases since 1969 of pre-sly screened individuals who had res during flight which could e explained by other factors. At one of these seizures was prob-flicker-induced. So, even with screening, one still cannot pre-vith certainty which people will ll not have seizures. Because low yield of EEG screening, ot practical to test all aircrew-nd potential passengers.

ides the flicker phenomenon, ventilation, fatigue, and over indulgence in alcohol have been known to trigger seizures in individuals prone to seizures. Head trauma, hypoxia, drug withdrawal, and cold exposure can cause seizures in previously normal individuals.

Fortunately, seizures during flight are very rare occurrences. However, even with the best screening techniques flight surgeons have, seizures will occur occasionally on . . . aircraft. Everyone in . . . aviation needs to be aware of the possible hazards of seizures in the aviation environment. Everyone should be able to recognize a seizure and institute appropriate first aid measures.

RECOGNITION OF A GRAND MAL (GENERALIZED) SEIZURE

1. Initially, the victim may complain of a strange feeling, or there may be no warning at all.

2. The victim may cry out; if standing, he will fall to the deck and lose consciousness.

3. His muscles will at first become tense and his body will become rigid. Breathing may stop temporarily and his face may turn blue.

4. The muscles of the body will then begin to jerk spasmodically. Breathing usually resumes but may be labored if the tongue has fallen back, obstructing the airway.

5. The victim may bite his tongue, froth at the mouth, or lose bowel and bladder control during the attack.

6. The seizure is usually over in a few minutes. The victim may be unconscious or semiconscious for a variable period of time afterwards.

FIRST AID FOR SEIZURE VICTIM

1. If possible, place a gag between the patient's teeth to prevent tongue biting. A wallet or a plastic airway makes a suitable gag. Avoid injuring the patient by trying to force something between clenched teeth. Never use your hand as a gag.

2. Loosen the patient's clothing.

3. Make sure the patient starts breathing again and has an open airway. Initiate CPR if necessary, but it rarely is.

4.. Protect the patient from injuring himself during the jerking phase. Do not forcibly restrain the victim unless this is necessary for flight safety. Injuries to the patient can be caused by overzealous restraint.

5. After the seizure, keep the patient warm and quiet. Turn his head to the side to prevent his choking should vomiting occur.

6. Anyone who has a seizure should be evaluated by a medical officer as soon as possible. – Courtesy *Rotor Breeze*. ★

An Inflight RIF

Captain David E. Pine 4235th Instructional Systems Development Squadron Carswell

Routine. The process had been accomplished so many times in the past it was hard to remember there were even written procedures on how it was supposed to be done. The chick, an F-4, had been taking drinks from the KC-135 Stratotanker on a regular basis on the way back to the States.

As is common for this type of mission, the tanker aircraft was the cell leader, providing navigation and fuel on the long redeployment flight from Europe for a four-ship of F-4s. What made this trip a little different was the fact that it would include a midair collision.

It began innocently enough. The last receiver to get a sip of JP-4 just sort of slid back to the trail position on the tanker rather than joining back with the rest of the flight on the wing. The boom operator, having watched his chick drop back after refueling, cleared off interphone and proceeded to the cockpit with the rest of his crew. Nobody was really breaking the rules too badly at this point, just bending them you might say. That's just the way Mr. Murphy (of Murphy's Law fame) likes to start things out.

The receiver should have pulled back into the wing formation but instead dropped back to do a lit-

tle systems checking anc
few items down in the lo
tanker boomer should have
the position of his receiver
leaving station, but after
watched the initial actions
fighter "assumed it would
they always do." We kno
"assume" does to us, don'

And the tanker pilot, M
Lead, he should always k
position of the people in
right? Sure. We've all bee

As things would happen
ceiver was pretty heavy
just taken on fuel. Since hi
were up, he hardly noti
slight increase in airspeed
of course, made for a sl

ease in distance between him d the tanker. The decrease con- ued until "the first time we (pilot d backseater) knew something s wrong was when a shadow d the cockpit." Finding them- ves directly under the tanker, ch now looked like a squadron C-5s, the pilot tried to avoid a air.

his is where Murphy was right he job again. Rather than exe- e the standard breakaway euver by pulling power and ng over, the F-4 jock applied er and tried to fly under the er. Unfortunately, although he ave headroom clearance, his asn't quite as lucky and ripped the undercarriage of the 135. e collision left pieces of F-4 mbedded in the tanker's gear s and a 4-foot section of ver- stabilizer missing from the ver. Murphy was pleased, hrough a few lucky breaks e two crews, both made it afe landing at an emergency d. Murphy hopes to do bet- xt time.

at went wrong? Why did two trained crews flying expen- ircraft blow it so badly? The er: lack of communication ailure to comply with direc- Pretty boring stuff, I must But that's the answer.

story isn't going to end in aditional lecture on "know esponsibilities and pro- s." Some people have a lot erience as flight crews, less. One thing we all have mon is professional train- l a set of rules which has eveloped by foresight and nocks. Let's take advan- them by being heads up ough things are "routine." pplying "new" procedures cause you find yourself nusual situation. Remem- mmunicate your intentions st of the flight; to "assume" only make a "you-know- ut of you and me but can an in-flight RIF. ★

STRESS

Anchard F. Zeller, Ph.D
Directorate of Aerospace Safety

At age 29 the pilot was
Mercifully, there is litt
gering pain associated
an aircraft strikes the grou
high speed. There is also n
for preparing an introsp
analysis, which would be of
assistance to the board con
to find the cause of the cr
seemed to that group, after e
ing every avenue, that th
craft was sound, the situati
over whelming, and the w
irrelevant. Review of the
background suggested that
ing and experience were ad
and that his physical conditi
sound. There were some
personal problems in his
diate past. In frustration, the
concluded the exact contr
of this psychic stress to th
dent was impossible to qua

This board's frustration i
cal. Take, for example, th
of the pilot at a TDY base,
ing that he was going hom
involved and unpleasant
action. The weather was ba
an unanticipated delay in
off resulted from some la
ute required maintenanc
proximately 2 minutes af
initiation of flight, the aircraft
out—the pilot was killed
sequent investigation s
that the flame-out was
failure of the pilot to proper
ate the fuel system and th
ejection been elected, it
not have been possible b
a safety pin had not been re

HIS LAST COMMUNICATI

Or, at the other end of
3 minutes out, a fighter pi
tinely contacted approach
and requested a penetrat
was instructed to desc
20,000 feet. He was next a
he would accept a VFR
to 5,000 feet and was instru
descend to that level an
instructions. Eight minute
he confirmed that he had r

hat altitude. That was his last communication. Two minutes later, a vitness saw the aircraft strike the round. Investigation indicated nat the pilot knew that his wife ould be waiting for him—would e waiting for a showdown. The idow was advised of her right disposition of the remains. The ur fatherless children, caught in circumstances beyond their ntrol, felt only sorrow.

The nagging suspicion that ychic pressures contribute easurably to such tragedies is t new. The problem of quantify- such effects, however, has dom been attempted. One re- t approach attempts to list life nts in terms of traumatic sev- y, ranging from the death of pouse, which is assigned the imum of 100 points, down to or violations of the law, which considered to have only an oint impact. The ultimate e of this project is to find a nod of accumulating the im- of these life change events quantitative fashion and de- ning some point at which the idual and the administra- are alerted to the possibility the impact may be severe gh to cause major behavioral ge.

CHIC PRESSURES
ATE STRESS

e more recent approach be- ursued by the Naval Safety r is to relate these psychic ures to increased accident ial. Now this isn't going to particularly easy task. The levels which individuals can e vary tremendously, and ents which provoke this are variable enough so that rd averages may well not ined enough to use as a or of increased accident al. In spite of these limita- however, the approach nts formal acceptance of uitively held feeling that psychic pressures can create stress which will directly affect skilled behavior.

A nagging question which arises in any attempt to relate specific background events to accidents is whether the population at large is subjected to the same pressures in the same proportion as those who receive acute attention because of their unfortunate involvement in some kind of mishap. The bigger problem then becomes one not only of accumulating the pressures but also of, in some way, reducing this to a ratio in terms of the ability to withstand stress. All of this, however, is in the future. The practical frustration which a mishap investigation board faces in attempting to make such assessment remains a reality.

In other instances there are certainly stresses, but they are not the result of any accumulation of quantifiable events. Rather, they are the result of an underlying temperamental quality. There are individuals who, from the accumulation of many experiences combined with emotional biological propensities, develop specific modes of behavior which almost always involve stress.

The pilot was a proud man. He was a member of an elite demonstration team. To go around when the situation became precarious would indeed have been an admission of defeat. The natural choice —make it and make it look good. The result—a destroyed airplane. Fortunately, the pilot lived.

Following one mission which had been aborted and the current mission, in which one go-around had already been made, the pilot was emotionally committed to landing at all costs. The cost was high—the landing was on a hill. This pilot also lived; others of the crew did not.

Or take the case of another demonstration pilot, also in the spotlight. The pressures were great—the expectations were high—the maneuver was aerodynamically unsound. The pilot died.

Sometimes the long-term patterns combine with acute events to create even more overwhelming situations. The pilot was an achiever. He wanted a good image —wanted to excel—and he had been doing both in his previous assignment. Currently he had not been doing so well in either his private or professional life. He had just been unwillingly divorced from a wife who had initiated the action. Although highly experienced, he had never flown a pop-up mission in an element wingman position. The second element, in which the pilot was assigned, initiated the pop-up and turned toward the target. It appeared the accident pilot was going to cut lead off, so the mission was aborted. He entered a low-speed stall condition from which he was not able to recover. How much did his personal problems contribute to this accident? We'll never know. Or how much did his need to prove his technical competence—to restore his self-image —contribute? This too we will also never know.

HE DIDN'T SURVIVE

There are other tensions that are not associated with either an accumulation of major life events or constant nagging pressure to excel above one's peers. Take, for example, the pilot who had an alleged violation filed against him in a preceding flight for an illegal climb through weather. It was not found valid during the investigation, but when the situation arose which could have been readily resolved by climbing out, he chose not to because he would be violating IFR procedures by so doing.

STRESS

continued

Did the suspicion that such a violation would bring him more unwelcome attention than he wanted have an effect on his decision? We can't ask him—he didn't survive the crash.

Or how about the case of the two crew members who had both been passed over for promotion to the next grade level? Flight lead in this operation was the ops officer. Did the desire to excel in his eyes cause them to make a steeper than normal pass, which shallowed out only just before contact with the ground? Again, it would be nice to have the benefits of a discussion with the crewmen.

The wingman looked back, saw lead moving in, looked back again and saw a ball of fire. The board determined that the pilot's proficiency in minimum altitude maneuvering was low. On the previous mission, he had had difficulty completing the attack and became lost. This fact had been brought to the attention of the mission commander, even though it was subsequently discovered that the navigation equipment had malfunctioned. Do you suppose the pilot was just not about to have that happen again?

Some other occurrences are more altruistically engendered. This crew was also pressing hard, concerned about another crew which had been lost several days following a crash. They failed to follow their briefing and attempted to fly beyond their skill and background. Human empathy would lead almost anyone to the conclusion that this violation was the direct result of a feeling of responsibility and concern.

ATTENTION DURING STRESS

If the conclusion is accepted, as it almost inevitably must be, that temperamental qualities and past emotional experiences can affect current behavior, the practical question which arises is, what can be done about it? The academic answer, which may be the best we can get, is that each individual becomes aware of the potential for degradation of skilled behavior and strives to neutralize the consequences. This can be done either by greater attention during known periods of stress, or perhaps even by avoiding certain activities entirely, at those times when the self-evaluation would indicate that the potential for influence is at a maximum. The probability that either of these things will be done, however, is not great. Even as the alcoholic, in transient moments of sobriety, resolves to avoid future involvement, so the stressed individual, in moments of calm, may make comparable resolves. But as the first drink destroys the alcoholic's resolve and his objective ability to assess the situation, so mounting stress may likewise impair the individual's ability to evaluate his potential impairment. This is a gloomy assessment, which represents the question of what can be done. If the individual cannot help himself, then help must be forthcoming from some other source. What other sources are there?

This brings into focus
other mishap, in which th
father, wife, operations
and peer companions k
his doubts regarding hi
ability and of the vacillati
he was experiencing in
a decision to discontinu
There is an axiom amo
fessional counselors whic
that if an individual threa
cide the threat should al
considered seriously, n
how unlikely it may see
individual to whom the s
is made. The very fact th
mal person would cons
solution to life's proble
indication that he or s
well implement it. Such
are also frequently a plea
Likewise, the professio
who expresses his desi
a flying career always
careful hearing. One s
frequently heard followin
hap is, "Everyone in the
knew that he was the m
one to have the next a
This ranks second onl
was the best pilot in th
ron."

Now it isn't really fa
the total burden of re
another's problems on
else. The fact does rem
ever, that in the tea
system each must be, i
brother's keeper, not
altruistic purposes eith
final analysis, self-pre
and the integrity of th
are ensured. Hopefull
proach so bravely u
by the Navy and civilia
communities will eve
sult in some quantifica
will make both self-r
and command reco
an increased potent
efficiency and ineffecti
parent. For now, how
astute awareness by a
possible any progre
preventing accidents
with psychic stress. ★

ET'S HAVE A FLY-IN

Directorate of Aerospace Safety Lt Col Robert L. Gardner

One of the most popular and effective methods of reaching significant numbers of civil aviators has been the civil aircraft fly-in.

irliner and Cessna collide over San Diego—150 lives are claimed;" "Two craft run together;" "Mid-ision between military jet lian plane destroys both." eadlines emphasize the seri-of our crowded skies. And, according to a recent article in *U. S. News and World Report,* the situation is getting worse. For example, in the last five years the number of private planes has increased 21 percent and now totals approximately 186,000. The same report points out that government estimates indicate that the number of aircraft in the U. S. will double to 375,000 by the year 2000.

These increasing numbers reflect a continuing problem of small, general aviation aircraft, commercial airliners and military craft vying for the same airspace. Although air traffic control

equipment and procedures have been improved and the FAA is studying sophisticated anticollision systems, the visual "see and be seen" method of collision avoidance remains the primary way to detect an impending midair disaster. Before you shrug your shoulders and turn the page exclaiming under your breath: "I always clear, and besides I can't do anything about those little bug smashers," hang with me a little longer.

There are some things we in the Air Force can do to reduce the midair and near-miss potential in our local flying areas. Programs to educate both civilian and military pilots of the collision threat not only reduce the midair potential but also have beneficial public relations spin-offs. One of the most popular and effective methods of reaching significant numbers of civil aviators has been the civil aircraft fly-in. Two Air Force bases who sponsored fly-ins within the past year had over 300 general aviation airplanes show up for their program. These bases considered the events a resounding success.

As with any successful project, there is a lot of planning and hard work involved. The wing commander and his staff, along with Airfield Management, Safety, Air Traffic Control, and the local FAA General Aviation District Office (GADO) must support the project and work together to develop an interesting, motivating program if the event is to be productive. Here is a list of topics suggested by one MAJCOM:

- Briefing or film on mission of the local unit and its major command.
- Visual aid briefings on local traffic patterns, high density areas, and low level training routes.
- Presentations by General Aviation District Office.
- Appearance of a noted aviation personality.
- Tours of RAPCON.
- Static displays of military and civilian aircraft.
- Tour and "flight time" in simulators.
- Aerospace physiology briefing.
- Spatial disorientation exhibit.
- Special luncheon.
- Commander's comments.
- Question and answer period.

Before committing to sponsor a civil fly-in, the following items should be considered. Is there sufficient interest in the civilian community to justify a fly-in? (Visits to local airports and contacts with civilian flying clubs, etc., can help give an input.)

Are the wing commander and his staff sold on the idea? Conduct initial planning several months prior to actual fly-in and select a specific date with an alternate in event of unforeseen problems. (Ensure there are no conflicts with other attractions which would draw the same audience.)

Review AFR 55-20 and submit necessary waiver requests to permit civilian aircraft to land at military installations. (Note: Hold harmless agreements and proof of insurance are required to be on file prior to civilian aircraft landing.)

Organize a working group with representatives from all units involved to discuss potential problems. S
working groups are: Ope
Arrivals/Departures group,
handling group, promotion
programs group, exhibits/f
group, concessions/luncheo
security and traffic contro
weather service group, med
vices group, communication
and transportation group.

Once the decision is made
fly-in, an important task is p
Plan big. Successful bases
tributed over 30,000 brochur
sure the information kits
flyers on the local flying
training routes along with
rival instructions. Even th
who don't attend will get th
potential hazards.

Try to keep the red t
minimum and make returnin
harmless agreements and pr
surance as painless as poss
July 1978 *USAF Safety*
Study Kit article "Aware
Key to Midair Prevention,"
some excellent examples of
include in an invitation kit.
issue of the Kit will include
checklist used by Tinker
their Safety fly-in. These c
tained through your local sa

The skies will contin
crowded and although effo
made to separate and limi
craft from commercial air
and military operating area
the air space has to be share
by all. A better knowledge
standing of each other's
just might prevent an accid
luck with your fly-in. ★

NEWS FOR CREWS

Information and tips to help your career from the folks at Air Force Military Personnel Center, Randolph AFB, TX.

CMSgt Dick Sanders
Air Force Manpower and Personnel Center

IMARY ENLISTED AIRCREW MANAGEMENT

Over the last two years, major changes in management of the enlisted aircrew members have evolved at AFMPC. Boom operators, gunners, flight engirs, loadmasters, and pararescuers are affected by these nges. Let me explain how the new process works.

he key to this new management style is known as ed Distribution and Training Management (RDTM). cally, RDTM is a systems concept originally designed employed to manage our rated officer force. The M process allows us to estimate requirements over a year period and match them against a projected inory of rated officers in each major weapon system 2, KC-135, C-130, C-141, etc.). This information en used to determine the number of new inputs that be trained each year.

similar analysis is now being focused on the enlisted w force. A committee was formed to work these lex and vitally important issues. The committee has entatives from MAJCOM and Air Staff operations ersonnel staffs and is chaired by the HQ USAF torate, Operations and Readiness (AF/XOO). They ate issues from a total force viewpoint, combining operations and personnel considerations. Subteams this executive committee structure are aligned by weapon system and meet semiannually and work unique to their weapon system group (e.g., Strategic , or Strategic Bomber, Tanker, etc.).

, al! of this sounds impressive, but what does it o you? It has a direct impact on you – the enlisted member. RDTM provided the analytical tools and ement guidelines to overhaul and streamline the airsignment process. To work your assignments with preciation of the enlisted aircrew members' situve've formed career management teams at AFMPC. eams are composed of former aircrew members road experience in operations. Your functional ntatives understand enlisted aircrew duties beey've been there.

functional representatives have access to all rents for their career fields. With this "big picture," ke assignments accordingly, but not in isolation. signment preferences are vital to the functional tative's effort to make the right man-job match.

The AF Form 392, Airman Preference Statement, is the primary method for you to state your assignment preferences to your functional manager. Instructions are on the back side of the form and can also be found in AFR 39-11, para 3-34. Several key points should be kept in mind when filling it out. Make it realistic and keep it up-to-date. If you want to remain at your present base, list that base as your first choice and fill in the remaining seven bases in order of preference. Since the AF Form 392 has been used, we've been able to build a good track record in matching requirements with desires. One thing is sure: chances for an assignment of your choice greatly improve when you use the Airman Preference Statement.

Effective enlisted aircrew management requires two-way communications – from us to you, such as this article; and from you to us – by letter, Form 392, and phone calls. If you have questions regarding any aspect of the personnel assignment system, please contact us. Remember – the most important element in the personnel management process is you.

AFMPC Functional Representatives

A111XO Gunner	SMSgt Timlake	MPCROR3E 487-4943/4944
A112XO Boom Operator	CMSgt Sanders	MPCROR3F 487-4953/4954
A113XO Flight Engineer	CMSgt Love	MPCROR4 487-4951/4961
A114XO Loadmaster	SMSgt Cress	MPCROR4 487-4961
A115XO Pararescue	*MSgt Keller	MPCRAW1 487-5821/5822

*The pararescue field, due to its small size, does not have a functional representative at AFMPC. Functional representation is provided at MAJCOM level with coordination through the resource manager at AFMPC.

CMSgt Sanders has been assigned to the Air Force Manpower and Personnel Center as a functional representative in the Rated Officer Career Management Branch since December 1975. Prior to his present assignment, CMSgt Sanders was assigned to Castle AFB CA as a KC-135 boom operator in the Standardization/Evaluation Section of the 93 BMW. He has 23 years experience as an enlisted crew member. ★

Mail & Miscellaneous

Send your ideas, comments, and questio
Editor, Aerospace Magazine
Norton, AFB, CA 92409

NOW YOU SEE IT . . .
NOW YOU DON'T

Your article on page 27 September 1978 *Aerospace Safety* was a welcome addition to our midair collision avoidance education program. But who would think of flying around with one eye closed, right? Wrong!! If you really want your "eyes watered," try the same test while wearing your trusty Oxygen Mask, type MBU-5/P. The portion of the mask covering the nose will cause the same phenomenon. Just put on your mask, hold the page at arms length with the cross directly in front of the right eye and move it toward you. Even with both eyes open, that 747 will varnish every time. For those of you not fortunate enough to own an oxygen mask, try placing an index finger vertically along the "leading edge" of your nose (on the outside, please) in lieu of the mask.

So much for the bad news; now for the good news. That one-and-a-half degree blind spot moves in direct relation to head or eye movement, so keep both your head and eyes moving.

JOHN P. AMIDON, Major, PaANG
Chief of Safety
112th Tactical Fighter Group (TAC)
Greater Pittsburgh International Airport
Pittsburgh, PA

443 SQUADRON

443 Squadron is alive and well and flying the Sea King all weather, ASW Helicopter from CFB Shearwater and the helicopter destroyer fleet. We are writing our history prior to receiving our colours in the summer of 1980. Former members of the illustrious Fighting Four Hundred and Forty-Third Squadron are encouraged to submit any information and personnel anecdotes which could enliven our publication. A reunion is now being planned so keep the summer of 1980 open and please send your name and address to be put on our mailing list. Send to:

Commanding Officer
443 Helicopter Anti-Submarine Squadron
Canadian Forces Base Shearwater
Shearwater, Nova Scotia
Canada
BOJ 3AO

WHAT IS SAFE FLYING?

Captain George R. Jackson
43d Strategic Wing/SE

Fly Smart, Stop—Think—Collect Your Wits, Know the Limits of Your Aircraft—We have all heard these "safe flying slogans" many times; but people still ask me," What is safe flying?"

I can't answer this question for every person on every occasion, but I do have a basic safe flying philosophy—*Don't Exceed Your Envelope.*

We have volumes of information that adequately describe the aircraft envelope, but what about the crew member's envelope? That envelope is known by one person only—the individual crew member.

The wing staff knows your past record, and can use it to predict the future; but only you feel and react to the immediate situation. You alone know the anxiety and tension of each event during the mission. When you feel the
sures, it may be your p
envelope closing in; and
time to change the situatio

What do I mean by cha
situation? Let me illustra
eral years ago a pilot flew
into some trees during
shower. During the appro
felt some anxiety concer
aircraft control and the
but he pressed on. A trag
only a few feet away be
made the go-around.

I think we all remembe
rible incident in Florida
young aircraft commande
land a 400,000 pound airp
two engines on fire. Why
he get the aircraft lined up
runway? Why did he ge
impossible go-around sit
seems clear that the pilo
pressure (perhaps press
his envelope shrinking)
didn't or couldn't change
uation.

Through study and
you can expand your en
include more situation
the tools that your squadr
available—flying safe
zines, training flight p
hangar flying, and all
Make sure you get all in
from the crew who had
recent emergency, and
you get the word out on
inflight problems.

Finally, don't be ove
events. Stay within your
don't press to test your
necessarily. If you thin
getting into trouble, do
You are already there.
within your envelope. ★

D STATES AIR FORCE

Well
Done
Award

Presented for
anding airmanship
d professional
ormance during
ardous situation
nd for a
ant contribution
to the
States Air Force
lent Prevention
Program.

Upper L—Capt Matthew W. Earl, Jr., R, SSgt John L. Christopher. Lower—L to R, Capt Norman C. McCaslin, Capt Kenneth L. Stroud, MSgt Carl D. Graham, MSgt Richard A. Roberts.

CAPTAIN
Matthew W. Earl, Jr., and Crew
11th Tactical Drone Squadron (TAC)
Davis-Monthan Air Force Base, Arizona

On 24 February 1978, while performing a full functional check flight of a DC-130A aircraft at 17,000 feet, the crew heard a loud ''boom.'' Master Sergeant Roberts checked the cargo compartment and reported the internal fuel tank had imploded and fuel was streaming into the cargo compartment. The crew immediately went on oxygen and performed appropriate emergency procedures. Immediate realization of the danger of having the fuel run forward in the cargo compartment where the electrical racks and the transformer rectifier unit are located prompted Captain Earl to establish a nose-high attitude to allow the fuel to flow toward the back of the aircraft. Master Sergeants Graham and Roberts opened the escape hatches to allow flow-through air circulation to remove explosive fumes from the aircraft. Then they improvised soundproofing material around the leaking tank to slow down the fuel flow. To avoid any type of electrical sparks, radio and interphone communications were cut to an absolute minimum and all switches on non-essential electrical equipment were left untouched. An uneventful landing was made with all crewmembers safely egressing the aircraft. The superior airmanship, prompt reaction to this serious in-flight emergency, and the professional competence demonstrated by the crew resulted in the saving of a valuable aircraft with no injuries or loss of life. WELL DONE! ★

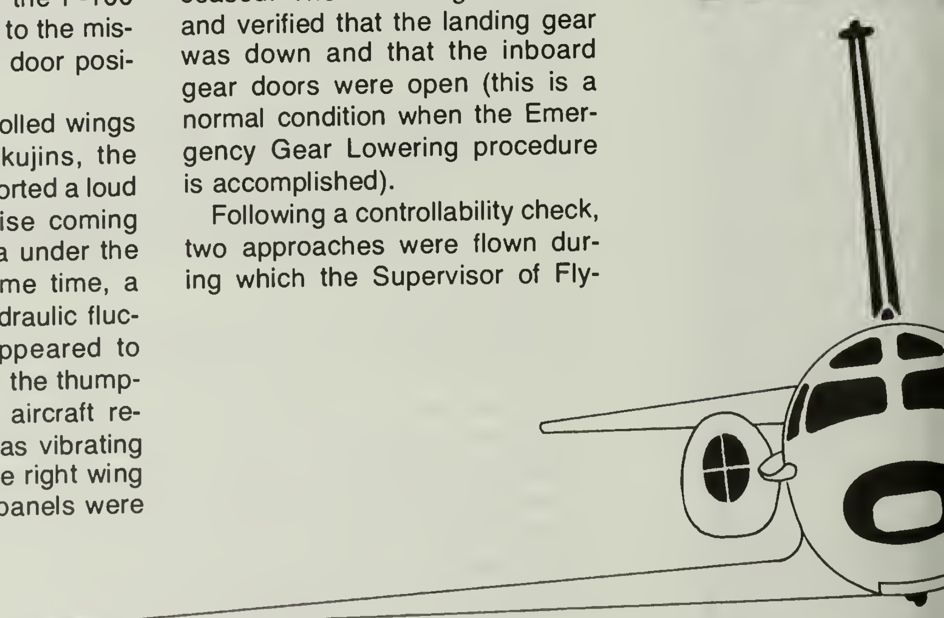
Things that go THUM

During a recent aero evaluation mission on a T-39B, some events occurred that had both the flight crew and ground support personnel scratching their heads for several rather exciting minutes. The first hour of the second mission was uneventful, but then the problems began. At 350 KIAS (red line airspeed) in a level 2G turn, a steady red light appeared in the gear handle. This condition indicated a gear in-transit status. The flight crew, Capt Lee Singer and Capt Tom Clapp, of the 4950 Test Wing at Wright-Patterson AFB, Ohio, began slowing the aircraft to 180 KIAS (gear limit speed) and asked the F-100 chase aircraft assigned to the mission, to verify the gear door position.

As the aircraft was rolled wings level, Ms Margaret Skujins, the flight test engineer, reported a loud rhythmic thumping noise coming from the aft cabin area under the cabin floor. At the same time, a rapid +/− 500 PSI hydraulic fluctuation began that appeared to cycle in sequence with the thumping noise. The chase aircraft reported that a panel was vibrating on the underside of the right wing root and that several panels were missing from the engine nacelles and aft section of the fuselage. The crew turned the T-39 towards WPAFB, coordinated an immediate return to the field, and requested that the chase aircraft accompany the T-39 on its return for landing.

As the aircraft speed continued to decrease, the frequency of the thumping noise diminished slightly but the magnitude of the hydraulic pressure fluctuations increased. The crew decided to follow the Landing Gear Emergency Lowering Checklist in response to the red light in the gear handle, but they were still unsure of the cause of the hydraulic fluctuations and the thumping noise, although all the symptoms appeared to be related. When the gear was lowered the red light in the gear handle went out, the three green "gear locked" lights came on and the thumping noise and hydraulic fluctuations ceased. The F-100 again closed and verified that the landing gear was down and that the inboard gear doors were open (this is a normal condition when the Emergency Gear Lowering procedure is accomplished).

Following a controllability check, two approaches were flown during which the Supervisor of Flying and a T-39 systems expert inspected the aircraft and found no damage or missing panels. However, following an uneventful landing when the aircraft was placed on jacks, with hydraulic power applied, the cyclic thump-



e flight

g occurred along with a corspoding one-inch up and down ovement of the right main gear or. This probably explained the rating panel reported by the ase pilot. The right main gear or switch was found to be innally defective causing a reated open and close signal to to the gear door system. This sed the hydraulic fluctuations the cyclic thumping noise. parently, a combination of high peed and acceleration forces duced conditions that started malfunction. A thorough inction of the airframe revealed the missing panels that were orted by the chase aircraft were, in reality, louvers and normal openings on the ennacelles.

o important lessons were ed during this incident: First, e that the chase pilot knows the aircraft that he is observ- supposed to look like. Next, faced with several conflict-

d confusing indications, the decided to correct the one malfunction that could y the problem (the gear light). Moral: Don't beso confused by numerous ction indications that you correct what can be con- You may get lucky and the problems at once. ★

NO ROOM FOR COMPLACENCY

***Sophisticated flight and navigation equipment are only aids to the pilot. Now more than ever a pilot must be true to his responsibility** as an aircraft commander.*

Years of experience teach a pilot so many things that a catalog of them would fill volumes. However, certain general topics emerge which can be discussed in a few paragraphs.

Beginning with "A," for no particular reason, we think of "alertness." Whereas a pilot's attention used to be focused on keeping the wings level, maintaining altitude and course and "keeping his head on a swivel," now the autopilot flies the airplane and radar controllers point out traffic. We hope. Is hope enough? Not enough for a full-time professional. He spends his time monitoring instruments and looking around, not reading.

Being constantly aware of exactly where one is in relation to airways, outer markers, airports and most important, the ground, is another form of alertness. In these days of almost continual radar vectoring, complete reliance on an outside agency for navigational guidance is the easy way, but it can lead you down the garden path or up the proverbial creek. It is not the professional way. Healthy skepticism of a radar controller is not an insult to his ability; it is a tribute to your professionalism.

The responsibility shouldered by a pilot when he departs on a flight is awesome. Acceptance of responsibility these days is unusual. Thus the pilot becomes unusual. People expect more of him. This becomes an additional responsibility to conduct himself at all times in a way that is a credit to him and to his colleagues, in a way that moves people to look up to him, not sideways, or even down. His high professional standards should be carried over into his personal standards. In a job that is of necessity largely unsupervised, his personal integrity must be unquestioned. Cheating should never occur to him. His reports of "on, in, out and off" times should be just as precise and exact as his ILS approach with 1800 RVR. The pilot who doesn't meet these standards damages his own reputation and those of his colleagues.

A cockpit organized along highly professional lines will never have room for complacency.—Adapted From North Central Airlines *The Ungarbled Word.*

nment Printing Office: 1978—683-011/2

ANNOUNC...

THE PROFESSIONAL APPROACH

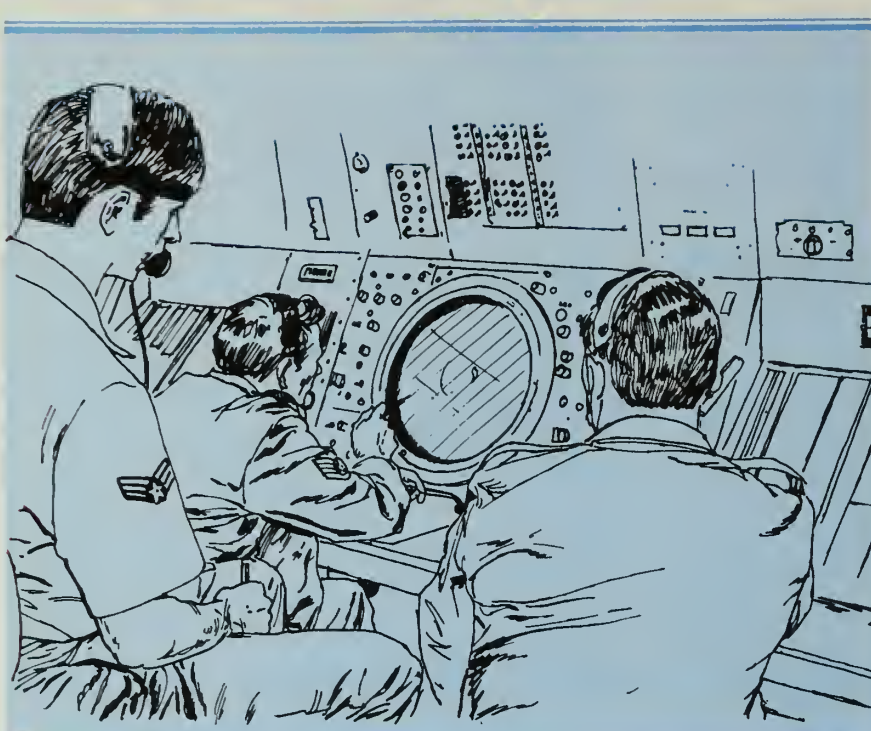
Air Force Communication Service, Scott AFB, IL

Do you have a question? Do you have a war story? Do you have anything you would like to share with other aircrews pertaining to instrument flying, criteria development, instrument procedures interpretation, NOTAMS, or flight information publications? Professional Approach is a new article designed to address these questions. But, we need your inputs to get this article out of the chocks. You, the operators, are the only ones who know what the current problems really are. So, if you would mail or call in problems, innovations, etc., we will write our articles accordingly. Our article may feature future NAV systems or a series of questions and answers or a potpourri of topics. Our foremost concern is to provide coverage in those areas that are most meaningful to you, the reader. So help us get off the ground by identifying those problems, questions, ideas, experiences or comments you may have. Fair enough? Don't hesitate, pick up the phone and tell us what you would like us to address. Better yet, write us a letter. We can be contacted at AFCS/FFOS (Flight Standards), Scott AFB IL 62225 or AUTOVON 638-5479, Commercial 618-256-5479. You can also find our address and phone number on the inside front cover of the FLIP (Enroute) IFR–Supplement.

AEROSPACE

SAFETY • MAGAZINE FOR AIRCREWS JANUARY 1979

PRELUDE TO REALITY



Captain Ronald H. Dalton • 1908 Communications Squadron • England AFB, LA

SSgt Roger Lund arrived for duty at Jones Radar Approach Control already tired from a long trip back from leave. The weather was definitely IFR and Sergeant Lund was hoping for a light traffic shift. As he sat down at the radar scope after being briefed of the traffic, any hopes of a slow night were erased with ten strips showing aircraft arrivals and departures already on the board.

Traffic was moving smoothly until MSgt Rivers, the shift supervisor, pointed out a possible conflict to Sgt Lund. Sgt Lund quickly gave alternate instructions to avoid a confliction and swore under his breath for not noticing the situation himself.

The assistant controller posted the latest weather and the airfield was now down to one mile visibility. "Jones Approach, this is Halo 22." Sgt Lund quickly scanned the strips in front of him and there was no strip on the aircraft calling. "Halo 22, this is Jones Approach, go ahead."

"Roger, Jones Approach, Halo 22 is 35 miles south of your station, minimum fuel, diverting to Jones AFB."

Sgt Lund quickly scanned his traffic and there was no room for Halo 22 – again Sgt Lund swore under his breath. Sgt Lund yelled at his assistant, "Get on the horn to Center and ask them about Halo 22. We don't have a flight plan."

A1C Levit, the assistant controller, called Center and the Center controller apologized for not calling in the inbound. He explained the Center was very busy, but he did confirm all the information on Halo 22 and advised the traffic was beginning to stack up.

A1C Levit relayed the information to Sgt Lund who again swore – out loud this time. "That's just great, Center is busy, aircraft are everywhere, and where do they think I'm going to put Halo 22!"

MSgt Rivers stood behind Sgt Lund and advised him that the GCA radar just went down and all tr would have to be vectored or h outer fixes. Sgt Lund began to fatigue began to take its toll. " Approach, Halo 22, do you ha further instructions?" "Jones Approach, Catfish 29, where a vectoring me?" "Jones Approa Shark 51, request your latest weather." Sgt Lund was starin the scope, but he was not react Finally, he turned to his superv and said, "I've lost the picture

MSgt Rivers turned and advi SSgt Polk to stop the problem a reset the targets. Sgt Rivers pla his hand on Sgt Lund's shoulde said, "Let's get a cup of coffe

"Roger, you were lucky toni MSgt Rivers began in a quiet b firm voice. "If this had not bee simulated problem, we may hav some airplanes." Sgt Lund wa visibly shaken even though it h only been a simulated problem. realized all too well the serious of his performance.

What went wrong? Sgt Lund stretched his leave to the last m He reported for duty not prepar mentally or physically to be his Does this situation sound famili How often do we place the live others in jeopardy by our mista Sgt Lund was a good controller fatigue and stress combined to destroy his ability.

Supervisors must be alert to t physical and mental condition o their people. Individuals must t not only of their own safety but safety of others. This concern f safety must override personal pleasure. It is far better to admi we are not ready to fly or contr traffic than to cover up with the of losing the picture.

If all of us will THINK SAF at all times, we will take the necessary steps to ensure safety not something we read about in magazine but rather something value and practice daily. ★

UNITED STATES AIR FORCE

JANUARY 1979

aerospace SAFETY

AFRP 127-2
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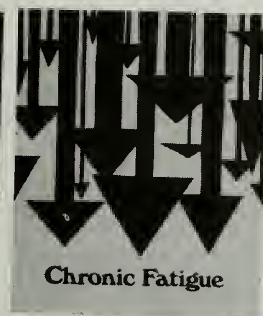
The lower you go.



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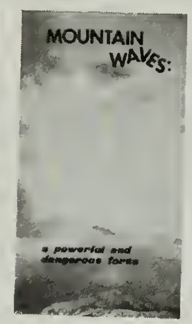


page 22

SPECIAL FEATURES

PAGE

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

JANUARY 1979 AFRP-127-2 VOLUME 35 NUMBER 1

Chronic Fatigue

Major Roger L. Jacks
Directorate of Aerospace Safety

Problems? Sure, everyone has problems. I mean serious problems — ones that have you going down for the count. For example, are you in the middle of a divorce? Are you totally frustrated with your career? Are you up to your neck in debt with a new house or car and about to get your knickers ripped? Have you been working your rear end off day in and day out and you're just plain pooped? A cold or hay fever got you down?

If you find yourself tired, depressed and tense you might have, or you might be, the perfect candidate for chronic fatigue. What's so bad about that? Well, for starters, you can be suffering from chronic fatigue and not know it! "Okay, so what is chronic fatigue, and why is it such bad news?"

Don't confuse the normal, everyday fatigue we experience after a hard day's work with chronic fatigue. Chronic fatigue occurs when the body continually performs mental and/or physical tasks without receiving proper rest, nutrition, and recreation. Insufficient recuperation and accumulated fatigue can cause a person's performance levels to deteriorate. The process may be so insidious at first that the person may be unaware it's happening.

One may be so involved with family problems, money problems, career frustrations, reasons for being overworked or fighting a physical ailment that he is unaware of the serious effect.

Once one has chronic fatigue, a vicious circle begins. For example, adequate rest is a standard human requirement, but the person with chronic fatigue may suffer from insomnia; good nutrition is essential, but he may have lost his appetite; one needs to be rational, patient and calm, but many times chronic fatigue causes irritability, apprehension and irrational behavior. Following are some of the effects of chronic fatigue on the crew member reported by behavioral scientists.

- Increased error potential.
- Increased reaction time.
- Deterioration in timing.
- Increasing willingness to accept lower standards.
- Instrument scanning patterns break down.
- Crew member pays more attention to individual task components to the exclusion of others.
- Tendency to neglect relevant cues.
- Tired pilots are rough on flight controls.
- Crew members become more aware of, and spend more time thinking about, physical discomforts.
- As fatigue worsens, the ability is lost to interpret kinesthetic sensations such as muscular motion, etc.
- Crew members make many mistakes on simple, well-learned tasks and blame these mistakes on the aircraft, not themselves.
- Fatigued crew members are not objective or reliable when asked to reconstruct what has occurred.
- Visual field begins to narrow.
- Attention span reduced.
- Fatigued crew members overlook important elements in a task series.

Although one may or may not be able to eliminate the factors causing chronic fatigue, much can be done to control their effects. To properly contain or eliminate the problem, we must address three areas: physiological, psychological, and pathological.

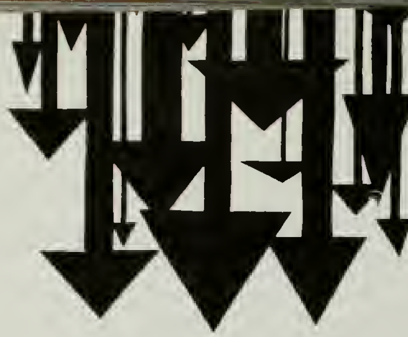
Physiologically, we can combat chronic fatigue with exercise, rest, and nutrition. Studies have proven that pilots in good physical condition are more mentally alert, have a greater capacity for work, are more cheerful and have a better outlook on life than those who neglect their physical condition. Under pressure, pilots in good physical condition are found to be more productive with much better recuperative powers than those less physically fit.

It stands to reason that physical fitness can play a large role in reducing fatigue. Ross A. McFarland, in a book entitled *Human Factors in Air Transportation,* lists the following shortcomings for an individual in poor physical condition:

- A greater percentage of oxygen consumed performing a task.
- More rapid pulse and breathing rate during work.
- Higher systolic blood pressure during work.
- Smaller stroke volume of the heart.
- Higher blood lactate level druing work.
- A slower return of the pulse rate and blood pressure to resting values after exercising.

A person must get the proper amount of rest. If an individual finds himself facing an abnormal fatigue producing situation, then he must adjust his sleep period to compensate, i.e., lengthen it. Quality of sleep is probably even more important than quantity. Supervisors can help by ensuring crew sleeping areas are well ventilated, comfortable and quiet.

Nutrition is very important. Well-balanced meals consumed at proper intervals will prevent hypoglycemia. Try to eat a high protein low residue meal a couple of hours before your show time. If it's going to be a long flight, make sure you take along some type of flight lunch. Drink plenty of fluids. Because of the low humidity level in most aircraft, a person should consume approximately eight ounces of fluid for every 30 minutes of flight. Note: A couple of cups of coffee may increase your sense of well-being and even mildly stimulate mental activity. Too much coffee, however, causes body dehydration. For example, for every four cups of coffee a crew member drinks, five cups of body fluid



Chronic Fatigue

will be lost through urination.

We've all heard much about the effects of alcohol, so I'll make my comments brief. It does cause dehydration and its effects can be long lasting. It takes 3 hours to burn up one ounce of alcohol. Alcohol usually means parties and late nights which can lead to fatigue, headaches and upset stomachs – the classic hangover. The end result is poor judgment, lack of mental awareness, and abnormal behavior when a person tries to fly. It is also a good idea to minimize smoking. Excessive smoking can produce 8-10 percent carbon monoxide-hemoglobin which may impair brain functions.

Let's move on to the psychological area. The easiest thing to say, and yet probably one of the hardest things to do, is to leave your family problems, money problems, career problems, etc., on the ground. It is a proven fact that the presence of serious problems or emotional stress can reduce a person's ability to perform skilled tasks. Psychological stress can burden the mind with anxiety, worry, frustration, and apprehension, making concentration on necessary tasks almost impossible. Emotional stress has been cited as a contributing factor in a significant number of our aircraft mishaps. The presence of mental conflicts has long been known to cause fatigue, and now research indicates that mental stress may make a person more susceptible to certain diseases. Crew members simply cannot afford to carry serious emotional problems aloft. They must learn to cope with their problems and, at least while flying, be in a state of emotional and physical well being. It's not an easy task, but it's something we must encourage if we want to decrease human factor mishaps.

Our third area is that of pathology or, in more simple terms, disease. Fighting diseases and the effects of medication designed to cure them can cause excessive fatigue. Although numerous articles on self-medication, flying with colds, etc., have been published, crew members continue to do it. Certain antihistamine preparations can cause adverse effects such as drowsiness, dizziness, nervousness, upset stomach, blurred vision and overstimulation of body functions. Add to that the effects of the cold itself: Blocked sinuses, breathing difficulties, dizziness, vertigo, aches and pains, and low energy levels, and you have compounded an already serious problem. Now, take the effects of fatigue and add them to the cold and self-medication effects. You no longer have just a serious problem; you have an accident looking for a place to happen.

Commander J. A. White of Tulane University School of Medicine makes an interesting observation: "Most Americans have from one to six colds a year. Although aviation personnel admittedly are a healthy group, they certainly average at least the minimum. Although all aircrew members know they are not supposed to fly with colds, they often do. In fact, there were 13 major aircraft accidents in a recent two-year period in which the common cold, although not on the manifest, was aboard."

The cure to this problem is actually fairly simple, and you've heard it many times before. Drink plenty of fluids, get lots of rest, eat well, see a flight surgeon and don't fly! Let the doc give you the proper medications and decide when you're ready to assume flying duties.

Flying is fatiguing enougl best way to avoid or minimize fects of chronic fatigue is to for your scheduled flight in tl possible physical and mental tion. Know the symptoms of and excessive fatigue. Stan Mohler in an article entitled "l in Aviation Activities," states: first indication of excessive in our occupation may appear a may be termed psychosomatic toms. These can include: heac burning eyes, sweating, hear chronic constipation or chron loose bowels, chronic loss of ap nightmares, and shortness of If you exhibit these symptom are not mentally and physically to fly, don't fly. You'll do y a favor and possibly help ho line on the accident rate. ★

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THERE IS A WAY

Annually the Air Force recognizes a given number of individuals, units and commands for outstanding performance in safety. However, competition is keen and not all win major awards. To recognize all of those, AEROSPACE SAFETY is featuring one or more in each edition. In this way we can all share in recognizing their fine performance and, perhaps, learn some valuable lessons.

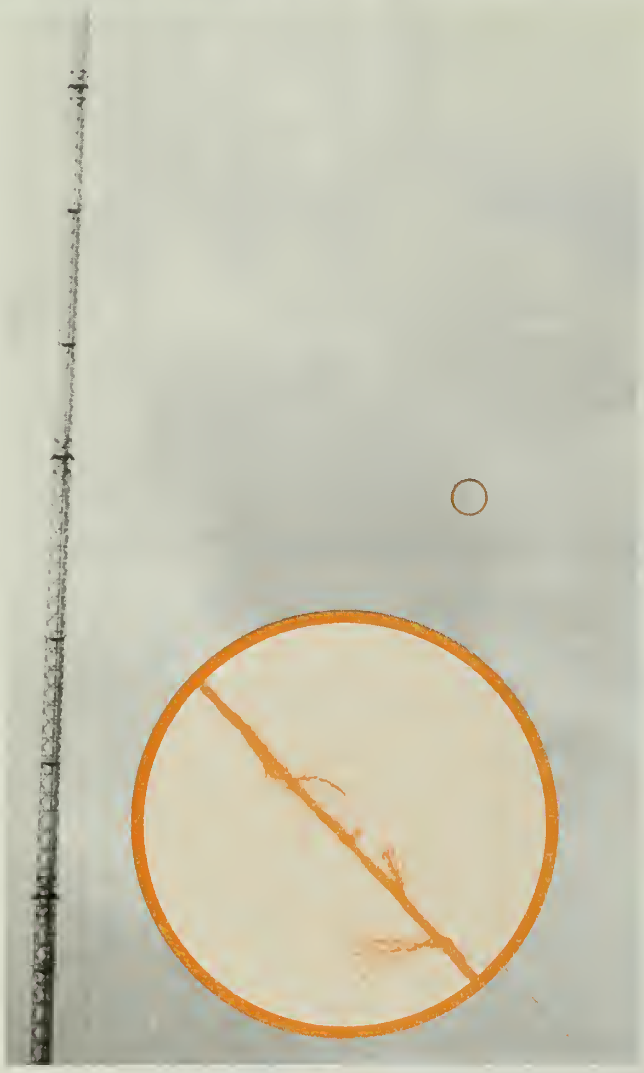
Nominated for the Koren Kolligian, Jr., Trophy

Captain John E. McKnight

Captain John E. McKnight of the 93rd Air Refueling quadron displayed exemplary professional performance during a night landing accident at Beale AFB, 'alifornia, on 29 April 1977. Captain McKnight was in e left seat of the KC-135 giving training to the student opilot who was in the right seat. After touchdown and the airdraft was being reconfigured for the subsequent keoff, unknown objects on the runway caught Captain McKnight's attention. Immediately thereafter, the craft impacted a herd of cattle which had strayed onto e runway from an adjacent field. The collision caused e nose gear to collapse and the left main landing gear separate from the aircraft, rupturing several main fuel nks. The intense heat generated by the sliding aircraft nited the leaking fuel, engulfing the entire aft section the aircraft in flames. Captain McKnight had already ırded the throttles to idle and raised the speed brakes. He was able to maintain directional control of the aircraft by the application of full right rudder while ıultaneously directing the crew to prepare to abandon aircraft. The aircraft then veered abruptly to the left bout 180 degrees and came to a stop on the airdrome ield. After ensuring that all seven crew members had successfully egressed, Captain McKnight ran to the ponding emergency vehicles and informed the rescue ersonnel that all crew members had safely exited the ıircraft. About this same time, the aircraft erupted in numerous explosions and was entirely engulfed in flames. Through his professional ability to function nder extreme stress, Captain McKnight's action was trumental to the safety of all the personnel involved. The effective training he gave to his students was apparent as the entire course of events from initial impact to final egress was a mere 45 seconds.

Major Justin J. Murphy

On 1 November 1977, Major Justin J. Murphy and his reconnaissance systems officer were scheduled to fly a classified SR-71 reconnaissance sortie. After approximately one hour and twenty minutes of flight and at the entry point to the reconnaissance collection area, the aircraft experienced a catastrophic hydraulic failure of the right engine inlet control system. Major Murphy was faced with a rapidly deteriorating situation. The aircraft was in a 30 degree left turn when the hydraulic system failed. System pressure instantaneously dropped to zero PSI, causing the right inlet to expell the supersonic shock wave which caused the aircraft to roll rapidly from 30 degrees of left bank to 45 degrees of right bank. Major Murphy re-initiated the left bank to maintain a track critical to the mission and initiated emergency descent procedures. During this critical action procedure, irregularity in engine airflow resulted in right engine flameout. During the yawing and vibrating descent caused by the flamed out right engine, the left engine also flamed out. From the point of initial hydraulic failure through the left turn and initiation of the emergency descent, only 10 seconds of time elapsed. During this brief period, Major Murphy turned the aircraft towards the emergency recovery airfield as it descended without power. Finally, at approximately 63,000 feet, the left engine was restarted; however, the right engine would not respond until the aircraft reached subsonic flight at 29,000 feet. He then executed recovery at a strange field emergency base. During this incident, Major Murphy demonstrated a high degree of professional leadership and competence. The fact that the aircraft was not destroyed is attributed to his exceptional flying skill and execution of timely and correct emergency procedures. ★



THE LOWER YOU GO

The flight of two F-4s on a night low-level mission had encountered no problems until they ran into deteriorating weather. Lead reversed course but number 2 lost him in the clouds. He broke out and tried to maintain VMC for a rejoin but got back into the clouds. When he next broke out he found himself at 600 ft eyeball-to-eyeball with a 1,020 ft TV antenna. A hard turn cleared the antenna but the left wing struck a guy wire, severing 93 of 163 strands of 2⅛ in cable. The cable neatly sliced four feet off the wing, but the pilot was able to take the aircraft home for a safe landing.

In a recent one-year peri
22 of our aircraft were
damaged or destroyed, anc
some crews killed, when th
flew into the ground or sor
other obstacle during low-
flight. The above is one
example. Labeled Controlle
Flight Into Terrain, these
mishaps occurred under a
number of different
circumstances. To cite a fe

This pilot really tried to k
himself. Fortunately, he dic
succeed. He was flying low
level in an A-37 and pulling
negative G as he topped th
hills and flew down the oth
side. During one −G perioc
heard a banging sound on

Photos at far left, page 6, show antenna and guy wire hit by F-4. Right hand photos show piece of wing sliced off and the damage to the remaining wing. Above and left, damage to F-15 wing and horizontal stab after collision with ground.

nopy, looked up and saw the ntrol lock which had fallen t of storage. He grabbed it d stuffed it in his ditty bag. on this scene was repeated cept that the loose object s the control lock housing. the pilot diverted his ention to retrieving the using, the aircraft hit some es. What do you do then? s pilot pulled more than 7 and lucked out.

low altitude flight of two 5s was performing basic ht maneuvers. With the IP in se position, the pair were ng through some hills at -300 feet AGL when the IP a cloud of dust and called a climb. After joinup, the IP could see damage to the left wing and left horizontal stabilizer that resulted from the aircraft striking the top of a ridge. A controllability check showed no problems and a safe landing was made. Color him lucky.

Others weren't so lucky.

A crew was flying a night low-level single shipper, IFR-VFR. During descending turns the aircraft flew into the ground. There was no attempt to eject.

An F-100 pilot apparently misjudged height over the ground and flew it in. He was very highly motivated on this flight and concerned about joining up with his wingman. Perhaps there was a split second of distraction when he looked back at more than 400 kts and less than 100 feet AGL. The desert bushes in that area are particularly small and may have led him to believe he was higher than he was.

A flight of two encountered bad weather and struck some trees. Both crews ejected, but one crewman didn't make it.

Another crew of two died when their aircraft struck a ridge during a low-level flight. Ironically, they were aborting the low-level part of the flight and joining on lead because of some weather reported ahead.

Some of the factors involved in these mishaps were

THE LOWER YOU GO continued

disorientation, distraction and diverted attention. Disorientation can be caused by many things. Weather is one — clouds and visibility deterioration of some degree can cause disorientation that could be easily handled at higher altitude but not at very low levels. Crews must be prepared by computing route abort altitude, maintaining pre-planned ground track and avoiding large excursions.

Illusions can be disastrous. Time, distance and speed influence what the pilot sees and thinks he sees. Flat terrain with little or no vegetation, water, snow can all affect a pilot's perception to the point where he can fly into the surface while thinking he is safely above it.

Low-level flying places severe demands on aircrews. Hazards multiply the lower we go. Aircraft were "shot down" by trees, wires, a cactus, weather, hills and mountains. This is where one second of inattention or distraction can be fatal. Crews must understand the environment as well as being highly trained in operating there. Here is where knowledge of the aircraft and its systems is essential. Where knowledge of both normal and emergency procedures must be as much a part of a crewman as his name.

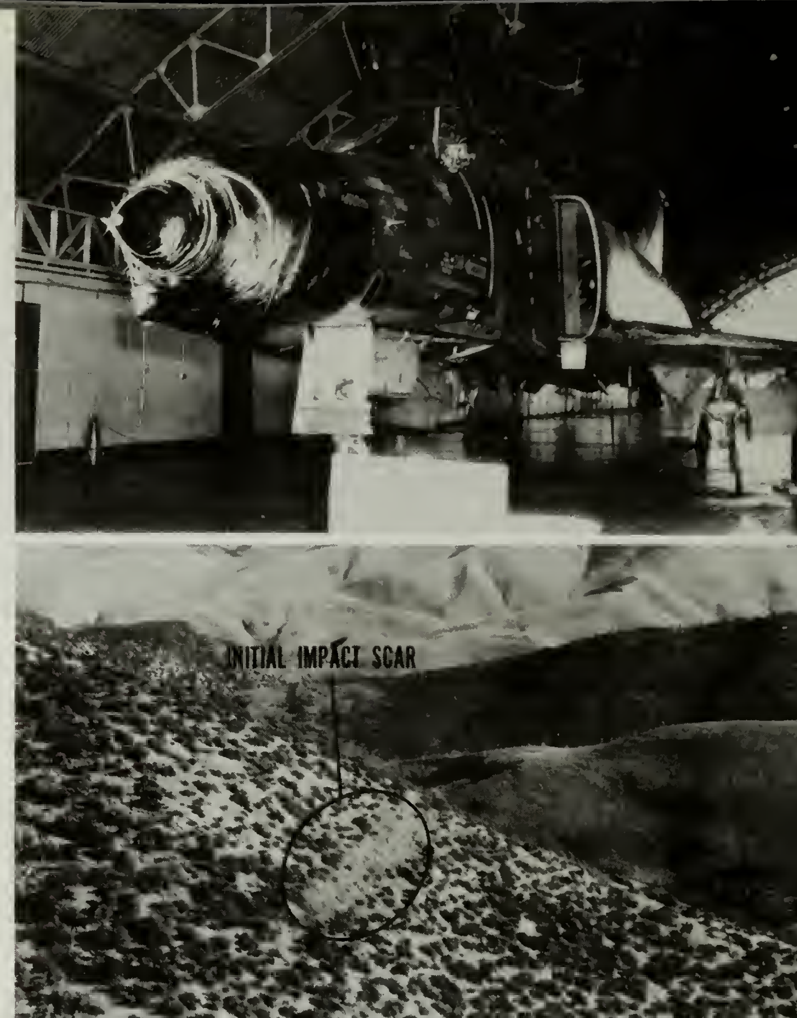
Missions must be thoroughly briefed. Each person must know what to expect from his fellow crewman and other members of the flight.

Low-level navigation, flying the aircraft, setting up for weapons delivery, keeping alert for "enemy" aircraft, being aware of the location of others in the flight, maintaining a scan for other aircraft such as a light plane traversing the area — all these must be dealt with. If the pilot feels he is getting over-saturated, the only solution is to break it off. Unfortunately, many accidents occur with the crew apparently unaware of their dangerous situation.

Knowledge of the terrain is essential, and that comes from careful, thorough study of the maps. One of the reasons for good pre-planning and briefing.

Low-level flying requires strict discipline, complete concentration on the task hand and good technique based on study and practi Practice is the key. With al other squares filled, a pilot will not be proficient at 10 AGL and 450 kts without d it.

Much of what has been s here may seem obvious. B for every item mentioned t is a pile of wreckage somewhere because some violated one or more of the for survival in the low-leve environment. ★



F-4D, top photo, struck trees on low level mission. Impact caused considerable dama tree sap covered windscreen making it difficult for pilot to see to land. Lower photo sho where another aircraft struck hillside. Spatial disorientation due to poor weather may ha tributed to this mishap.

THE PROFESSIONAL APPROACH

ir Force Communications Service • Scott AFB IL

ENROUTE DESCENT

The enroute descent is often flown in lieu of a pub-
shed penetration and provides the pilot and air traffic
ontroller a flexible method of descending to final
pproach. It also aids in expediting movement of air
affic, and usually reduces total enroute flying time.
ne enroute descent may be conducted via nonradar
utings using navigational aids or via radar vectors.
r traffic controllers will not insist an enroute descent
conducted, authorize an enroute descent if ab-
rmal delays are anticipated, nor terminate the serv-
without the pilot's consent, except in an emer-
ncy.

To perform an enroute descent in a safe and pro-
ssional manner, you must be aware of several
nning considerations that will affect the accom-
shments of the descent:

• Your starting point for the enroute descent
ould depend upon altitude, ground speed, airport
vation and desired rate of descent. A rule of thumb
t can be used is to begin the descent at a distance
NM) in multiples of the aircraft altitude in thousands
feet plus 10 miles. Some preplanning for your
cific aircraft will give you the multiple (2X, 3X,
) that provides a descent rate suitable for your
sion or configuration. When a steeper or more
dual descent rate is desired you must adjust your
cent distance from your destination. In any case,
rdinate your descent starting point with the air
ic controller, since there may be restrictions based
other air traffic. Caution—beginning descent early
high descent rate will result in prolonged oper-
n at low altitude with corresponding high fuel con-
ption.

The type of final approach to be conducted must
nderstood by you and the controller. You should
est an enroute descent to a specific final ap-
ch fix that serves the destination airport. You will
have a definite clearance limit fix which could
ent confusion in the event of a two-way com-
ications failure. We recommend you select a published approach suitable for weather conditions and request a clearance from ATC to fly that approach in the event of communications failure.

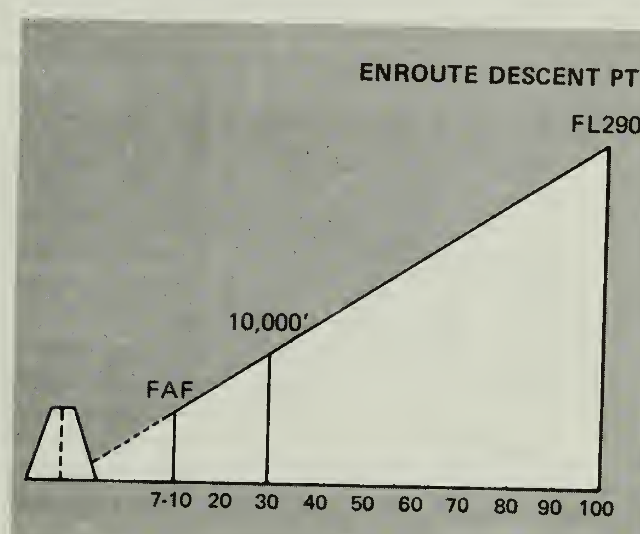
Your enroute descent to a normal low altitude instrument approach may be enhanced by the following techniques.

• Plan your descent to arrive at about 10,000 feet AGL and 30 NM from the threshold of the landing runway. If you are coming from the opposite direction of the landing runway, plan your 30 NM point to include distances you will travel in the pattern. Below 10,000 MSL, airspeed should be no more than 250 k unless aircraft operating limitations or military normal operating procedures require greater airspeed. This provides a more consistent flow of air traffic, makes the controller's job less complicated, and allows you more time to accomplish cockpit duties.

• Remain oriented in relation to the final approach fix by using all available navigational aids, especially when the descent is conducted via radar vector. Plan ahead to ensure the aircraft is properly configured and you are prepared to fly the approach when cleared by the air traffic controller.

An understanding of the information in this article and some preplanning are a minimum requirement necessary for a safe and successful enroute descent. Of equal importance are the operating characteristics and limitations of individual aircraft. The flexibility of the enroute descent makes it a desirable maneuver in many instances; yet, because of the many variables involved, the pilot may be required to exercise more judgment than normally required during a published penetration.

We want to make this feature responsive to the needs of aircrews. So, tell us what you want, fire questions, share your knowledge and experience. Together we can work for the good of us all. AUTOVON: 638-5479. Letters: AFCS/FFOS (Flight Standards), Scott AFB, IL 62225. ★



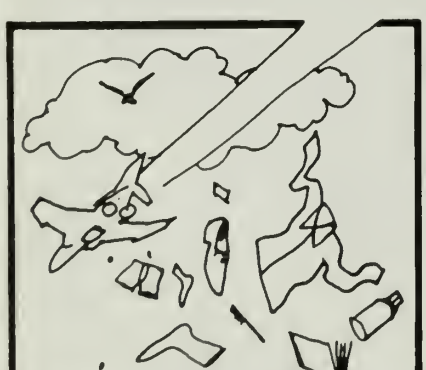
OPS TOPICS

LACK OF COMMUNICATION—COSTLY

The Phantom was preparing for a cross-country launch after a static display. The aircrew had loaded the travel pod with their personal belongings and most of the aircraft's 780 gear when the transient alert (TA) crew arrived at the aircraft.

The pilot asked the transient alert personnel to check the travel pod door closed and secured and told TA he would require an end of runway (EOR) check. The transient alert crew understood an EOR check would be needed but does not remember being told specifically to close and secure the travel pod door. The aircraft was started and taxied to the end of the runway. TA performed a leak check, but did not check the travel pod.

During takeoff roll fire department personnel noticed objects fall from the aircraft. These articles were personal clothes bags. When the aircraft landed, the travel pod was empty. The 780 equipment and a packed drag chute had fallen out during the flight and have not been recovered.



AIRPORT INFO

A recent National Transportation Safety Board (NTSB) report of a civil aircraft accident revealed inaccurate information was contained in the Airman's Information Manual (AIM) Airport Directory for the Airport where the accident occurred. A remark reflecting the correct information had been in the FAA Airport Master Record as early as 1965 but was not published in the AIM until after the accident.

USAF airfield and approach information is contained in many different publications—Instrument Approach Procedure charts, Enroute Supplement, FLIP, AIM, Sectional Charts, etc. They are published by different agencies—Defense Mapping Agency Aerospace Center (DMAAC), Federal Aviation Administration (FAA), National Ocean Survey (NOS).

When was the last time the air field information for your base was checked for accuracy?—Maj Joseph R. Yadouga, Directorate of Aerospace Safety.

THREE TIMES LUCKY

The PSA-Cessna 172 midair collision over San Diego shocked the nation and started a barrage of verbiage over air traffic safety. Those of us in the business were probably just as apalled as the layman, but not as shocked because we have more knowledge of the frequency of near midairs. We mention this frequently in these pages, and we will continue to do so to try to head off any c placency on the part of USAF cr

ITEM: C-5A—light aircraft. light plane passed in front of the at about 300 feet. No time for sive action. Light plane not on ra

ITEM: C-141—Cessna 172. sna passed in front of C-141. did not see USAF plane until a senger told him later. Estim miss distance 500 feet.

ITEM: T-38—Cessna 172. pilot had to push over to avoid T-38 went under and aft by 150 feet.

CREW WORKOUT

As the pilot of an RF-4C beg right turn out of traffic at 400′ A the aircraft rolled rapidly to n 90° even though he had the stick left. With the WSO's help, flight was achieved at about 30 The crew declared an emergency tried various remedies to no and got a chase aircraft which ported the left aileron was dow inches and the right one 6 inches the aircraft in a right turn. Fin with both crewmembers musc the controls they were able to a safe landing. Both were exhau from constant left stick and ru inputs. The culprit was FOD i form of a 5/8-inch number 10 s jammed between the lateral co bellcrank and the enclosing b head. Runaway trim contribute the crew's difficulties. Estim stick force to keep wings level 30 lbs. This crew had a real wor

OPS TOPICS

FLYING WITH A HOT SEAT

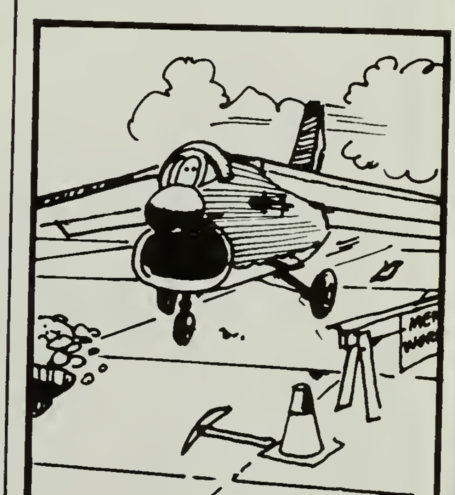
An F-4 pilot flying an instrument raining sortie lowered and raised the jection seat handle guard at the ap- ropriate times. Upon departing the ircraft, his foot brushed against the andle and he noticed that it was ocked to one side. Thinking this nusual, he wrote it up. Egress tech- icians responding to the write-up ound that someone had apparently ılled the handle out of its detent robably while the safety pins were ill installed). It was then pushed own between the survival kit and e front edge of the seat bucket. nis condition cannot be easily de- cted by the pilot during pre-flight. ven though the pilot lowered and ised the handle guard to arm and fe the seat when he was supposed , he was really not safing the seat nen he raised the guard because the ndle was not in its detent. He was, effect, sitting in an armed seat that s very ready to fire had his legs or ything else tugged at the handle Mr. Rudolph Delgado, Directorate Aerospace Safety.

HOW MANY TIMES?

During preflight the transient alert crew chief was told by the aircraft commander that, after electrical power was applied to the aircraft, he would have to remove the drop tank pins and give them to the back seater. After the Dash 60 unit was hooked up to the aircraft, the pilot signaled the ground crew that the power was not on the aircraft. The ground crewman wiggled the plug and got no further response from the flight crew. The pilot stated that after not being able to get external power he elected to make a battery start. No change in start procedures were briefed to the ground crew before the battery start was attempted. After the number two engine was started and the right generator was turned on, the crew chief removed the tank pins and threw them to the WSO, despite attempts by the aircraft commander to wave him off. The crew chief did not notice the pilot's actions. The pilot shut the engine down, but it was too late. The pins sailed over the WSO's head and entered the right engine causing extensive FOD to the compressor section. Oh, Lord, how many times?

A YELLOW "X"

We often see such words as complacenecy, mental set, task saturation as they apply to flying aircraft. In the following narrative they all come together and produce a yellow ''X''. The aircraft diverted to base B (a P-PR) because of weather. At first the pilot's request was denied because of an ORI in progress, but with the aircraft low on fuel a PPR number was issued. Now at base B the first 7,000 feet of runway was closed, leaving the last 5,000 feet open. The pilot did not ask for NOTAMs but was advised of the runway condition. Sometime earlier he had landed there and the first 5,000 feet were open and the rest of the runway closed. The controller's message did not penetrate. Neither did the MDA given by the controller which varied from the IFR Supplement. Neither did the displaced VASI lights. The aircraft landed on the closed part of the runway. Action taken: Base B painted a large yellow ''X'' on the closed portion of the runway. Wonder if it glows in the dark. ★



Pieces From The Past

Major P. D. Smith
Directorate of Aerospace Safety

Mission terminated, the aircraft was returning to base. The crew, within a few miles of homeplate, relaxed and started thinking about lunch and how they would spend the afternoon. With the ceiling lowering, there would be no low level work. Suddenly a mighty noise slammed across the desert, echoing and re-echoing against the barren, rocky hills. A fireball rocketed upward . . . nearly three decades later. . . .

One of the more enjoyable ways I have found to spend a Saturday with my two sons (ages 12 and 14) is to haul the dirt bikes out for a ride in the Southern California desert. It's always an adventure, but a recent outing in the El Mirage dry lake area held something extra. A discovery we made there let us play accident investigator and gave the kids a glimpse of what goes on where old Dad spends his working day – at the Air Force Inspection and Safety Center.

We started this ride, as we had on previous trips to El Mirage, by just cruising around the lake bed. It's a unique experience – like driving a fast boat on a real lake. Turns can be made at will in any direction and at almost any speed. There are some hazards though. Occasionally, one will check his six o'clock position and find a 4-ton motor home bearing down in pursuit of a new land speed record. A melange of California fun seekers can usually be found stirring the weekend dust at El Mirage, and this day was no exception. There were dune buggies, dirt bikes, land sailers, a homemade go-cart engine-powered biplane being tested while a Benson Gyrocopter flew chase. All of this was presided over by a covey of four elegant sailplanes.

We eventually tired of dodg
the participants in this three-ri
circus and number two son, M
suggested a ride into the rocky
foothills to the north. The high
speed cross-country trail ride
deteriorated into a muscle wre
struggle with a sand wash as w
climbed higher into the rocky
slopes. It was time for a break
kickstands came down, the hel
off, and we headed for the sha
side of a large boulder. On the
Phil kicked aside a piece of pla
with shattered glass clinging to
sides. Sitting in the shade of th
boulder and passing the cantee
enjoyed a panoramic view of th
lakebed, now well below us an
several miles away. Marty pick
a thick piece of curved plexigla
almost opaque with age. "Hey
those are airplane parts." Some
machine from a previous age m

have met its end here just below the highest peak in the area. "Let's see what else we can find."

Easter egg hunt tactics yielded bits of bent O.D. painted aluminum, a piece of fiberglass duct, a sheared bolt with P-W stamped on the end. Recognizing a chance to dazzle the kids with my knowledge of things aeronautical, I bragged, "If you guys find enough parts, I can identify this plane and we can find out when and why it crashed."

The scavenger hunt itensified. We covered the top of a large flat rock with bits and pieces: more aluminum scraps, magnesium casting, and a "press-to-cage" button. "Cockpit parts. That's what we need. This thing has to be very old, but somebody back at the office might recognize the cockpit stuff."

Two pieces of plastic trim wheels told me that it was a large aircraft, but our search ended with nothing positive. We rode out that day with me thinking only of jet aircraft. Driving home with the cycles in tow on the trailer, I finally realized that those odd tubes-within-tubes we found were engine push rods. Our bird was a Pratt & Whitney-powered recip, not a jet.

Identifying the plane became an obsession with us. We had to try again. This time a piece of trim wheel and a "flap release" button bearing the Boeing label were found. We were narrowing it down. I turned over a shiny plate that looked like a tin can lid, and we were handed the answers we sought. It was the aircraft identification plate which gave us the serial number. The aircraft was a Boeing B-50D with Pratt & Whitney R-4360 engines.

Answering the rest of our questions would now be a routine matter. Phil and Marty were eager to know how closely all our conjectured theories matched the real facts, so I went to work early that Monday and dug into the files. Back in the early 1951 cards was the reference I needed. The microfilmed copy of the accident report went into the film reader and the quickly scanned pages showed that it was a test flight. My mind conjured up scenes of the crew struggling with the mighty B-50, crippled by some circumstance of the test mission. But, when I finally got to the bottom line, I was forced to ponder a phrase I have heard many times here at the Center: "There are no new causes — only new accidents." The cause was stated simply as "attempting VFR flight in IFR conditions."

The flight had originiated 27 years ago with a morning takeoff and a climb through a broken overcast to 30,000 feet to test an experimental fuel tank inerting system. A minor problem terminated the test and the B-50 circled George AFB under a 6,000-foot ceiling. At 1100, it departed George on a direct course for Edwards, still VFR, but apparently into a lowering overcast. At 1105, the perfectly functioning B-50, flying at 3,924 feet, encountered the rocky ridge line 10 feet below the top. Eight men were on board.

The kids were reluctant to accept such a mundane cause for the catastrophic event. "Yes," I assured them, "the airplane was equipped to fly on instruments, the crew was qualified, they had to be aware of terrain elevation." I asked them to recall the multitude of times, in the 3 years we have lived here, that civilian aircraft have been "gobbled up" by the local mountains when an unfortunate pilot tried to pick his way through below an overcast. They could relate to that — it always makes the 6 o'clock news.

"Attemtped VFR flight in IFR conditions." I wonder how many more times those words will form that very final ending of reports and aviators. ★

WEATHER RADAR -- ATC RADA

There is a difference

Since the first day of undergraduate flying training you were probably warned to respect thunderstorms. AFR 60-16 and MAJCOM supplements provide direction on avoidance criteria for these storms. But when the ARTCC relays a SIGMET telling you a squall line blocks your airway and radar indicates it is just 10-15 minutes ahead, where do you turn for help?

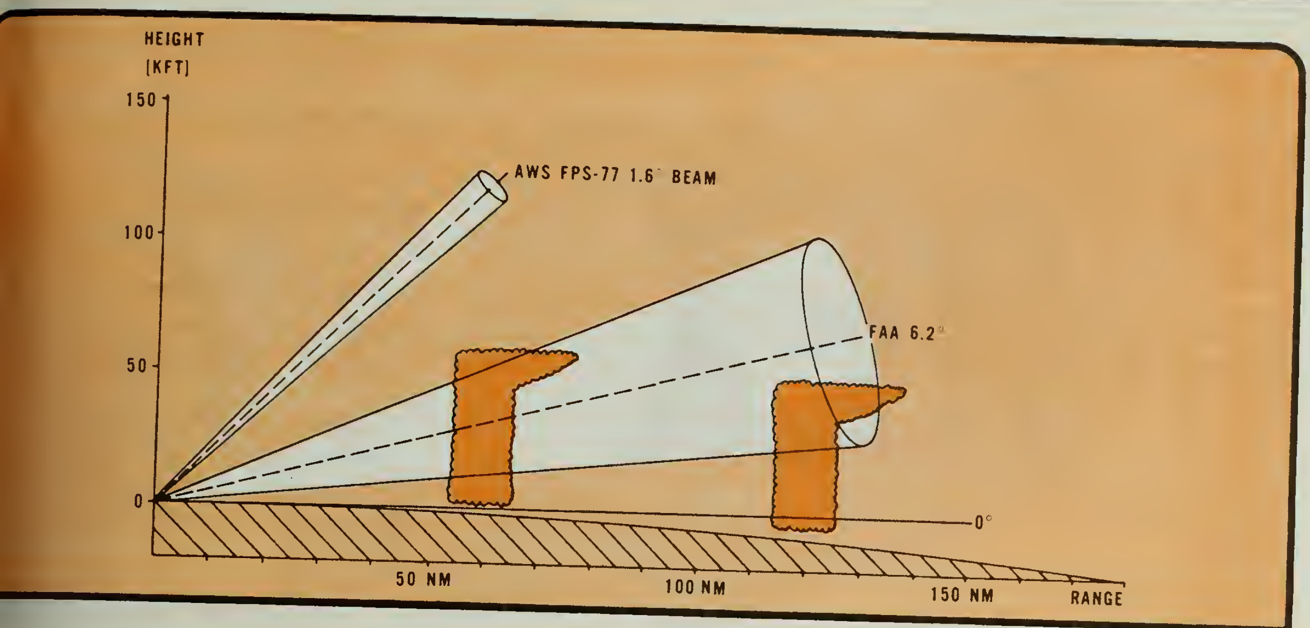
Your first instinct is probably to ask the center controller for help. But before relying totally on the center's assistance, you should be aware of the dubious accuracy of weather information displayed on the controller's scope that would be used to provide "weather vectors."

Air Weather Service (MAC) recently made a study of the FAA's air traffic control (ATC) radars. Air Weather Service concluded that the capability of these radars leaves much to be desired when trying to detect and display the location and intensity of convective cells.

The intensity of weather cells is determined by the relative amount of energy reflected from the cell back to the radar. This reflected energy is expressed in terms of decibels (dBZ). A relationship between dBZ values and weather cell intensity is shown in Table 1.

One major shortcoming of ATC radars is the inability to obtain accurate dBZ measurements. These inaccuracies result from radar characteristics and controller procedures. For example:

The wide beam width of FAA radars causes reflectivity losses of 8.8



1 Depiction of a 6.2° radar beamwidth viewing severe thunderstorms at 60 NM and 120 NM.

BZ	INTENSITY
55	TRWXX (Extreme)
50	TRWX (Intense)
14	TRW++ (Very Strong)
30	TRW+ (Strong)
30	TRW (Moderate)
0	TRW- (Weak)

TABLE 1

at 60NM to 24.8 dZB at 120

hoes at different ranges from ntenna must be displayed so that es nearer the antenna do not ap- stronger than strong echoes er from the antenna. To do this, rmalization factor must be ap- however, this factor is not the for aircraft and weather targets. ormalization factor used by the is for aircraft targets (not weath- gets), and it is not standard for TC radars. Further, controllers st changes in these settings from site to radar site. Therefore, these radars are used to detect er echoes, losses in weather intensity may occur. These may be as much as 36.8 dBZ NM to 52.8 dBZ at 120NM, corrections are made for these

Major Duane B. Stoecklin
Hq Air Weather Service Field Support

losses before echoes are displayed on the controller's scope.

What does all this mean to the aircrews? It means the controller may unintentionally "vector" your aircraft into thunderstorms because his radar scope does not provide him accurate weather echo information. The problem is that the apparently moderate thunderstorms (30 dBZ) on the controller's scope may actually be an intense or extreme thunderstorm (50-55+dBZ). Also, weak or moderate thunderstorms (10-30 dBZ) may exist along your route, but the controller's scope will show no activity because of echo intensity losses that occur on his radar.

Another shortcoming of ATC radars is the inability to measure storm tops. FAA radars have a fan shaped beam which rotates at a *fixed elevation angle* while weather radars employ a pencil beam and the *elevation angle can be adjusted* to measure tops of cells.

Figure 1 compares the size of the FAA radar beam width (6.2) and the FPS-77 weather radar beam (1.6). A typical FAA radar has its beam axis set at a 5° elevation angle as shown. Beyond 60NM in range, it will detect less and less of large storms and may miss smaller storms completely. In contrast, the FPS-77 beam can move vertically to detect the vertical extent of storms anywhere between 5NM and 125NM.

Therefore, when you are flying in an area of known or suspected thunderstorms, make maximum use of Pilot to Metro Service (PMSV) provided by an AWS base weather station with a weather radar. These radars are designed to detect and accurately display weather targets. AWS forecasters can't provide aircrews with flight direction vectors, but they can provide storm tops as well as location and movement of echoes in relation to airways.

In summary, ATC radars are primarily designed and used to separate aircraft traffic. When used to display and interpret weather information they have several shortcomings. Hence, aircrews that rely totally on thunderstorm avoidance information from the center controller may find themselves actually penetrating storms the controller cannot see on his scope. ★

REX

One word before we pass on some letters recently received. Confusion still runs rampant about the scope and intent of the "Rex Riley Transient Services Award Program."

The award program consists of informal evaluations of USAF and USAF/ANG bases which are available to transient aircrews for stopovers or RON's. Thus the intent—we look at a base from a safety convenience, servicing and irritant standpoint as if we were a transient stopping for fuel, food and/or lodging. Our theory is that a transient aircrew in a strange type of aircraft is very vulnerable to a possible mishap. Not only is TA important but also such areas as Base Ops, inflight kitchen, transportation, billeting, snack bars, clubs, etc. We freely admit that we don't play fair—we play Devil's advocate and often try to empathize with our theoretical transient crew in the worst possible set of circumstances. We don't claim to know your business—most folks know and operate well their own little segment of the base. What we really look for are cooperation between agencies and also the extra effort which people expend to make an airecrew stop safer and more pleasant.

There is no set time period! We are planning to try to visit units regularly with a maximum of two years' time lapse between visits. I have, however, revisited one base three times this year so don't sit back on your assets just because you just received the evaluation and certificate.

And now, some feedback from the field. . . .

WHAT SERVICE?

It was one of those beautiful autumn weekends. We had a cross-country trip to . . . AFB. Sho for the crew at home station was 1700 with departure. Everything progressed just like work including the anti-hijack inspection on passengers who were going along.

The flight was uneventful, and a most enj weekend was spent (as far as the passenger concerned). The crew had to fly overwater tional missions on Saturday, so they spent thei tiful weekend in the blue.

Then, as usual, came the time when all good must come to an end; and on Sunday morni 15 passengers arrived at Base Operations in ration for the return trip. Being an old Base O (and still am), I do quite a bit of observing whe ceed to another field. Not only do I do a lot of ing of Base Operations, but also of the aircre in planning and flying. Hey, let's face it, anytim steal a good idea and bring it home to make m better, I will do it.

Well, my first and last impression of Base ations was that if the individual with whom I de working for me I would have fired him long be ever sewed on those stripes that he was wea

Being one of the first to arrive at Base Oper I tried to gather information for the crew. Th like trying to pull hens' teeth. When I first appr the counter the dispatcher was, I think, asleep, in many dreams somewhere else. I waited proximately 15 minutes, then I finally got the c to disturb him by asking him if he had heard fr crew for transportation. Without getting up fr chair he managed a "Yeah." He asked me who I told him I was on the C-130 that came in

night. He then asked me, "Which C-130?" That must have been a tough one as we were the one and only C-130 within several hundred miles.

Knowing that the crew had intended to fly an overwater navigational training mission on the return trip, I asked him where the flight planning room was located, and, without saying a word, he pointed to a door. As I went through the door that was pointed out to me, I noticed a very well kept flight planning room—so sanitary that I could not locate a DD Form 1801 (ICAO Flt Plan), a DD Form 175-1 (There is a TV weather briefing set up), or AF Form 70s. I reapproached the dispatch counter and asked where were these items? I was rudely told to look in the drawers under the flight planning table and I would find them.

After finally finding the needed forms, I started to do a little flight planning. All of a sudden I realized that, hey, I've been here for 30 minutes and no crew yet. I went back out to the counter and asked the dispatcher if he was sure that transport had been sent to pick up the crew. With that question I guess I really upset him. Real snappy—he told me that he had sent the transport, but the driver had to refuel his vehicle first. It was 1030 by that time, so I did as much flight planning as I could Finally, the crew showed up and jokingly the aircraft commander told me that I was some kind of a pal because I didn't even send transport for them on time. I told them about the problems I had since I had arrived. The AC just couldn't believe what I was saying. Finally, the crew obtained everything, filed, and we started to depart for the aircraft. Well, this was the second gaggle. The crew bus driver only had a step van. As it turned out, he had to make three trips to the aircraft. Boy, this really went well—especially after the previous comedy. We finally boarded, started engines, taxied out for runway, received instructions to taxi onto the active and hold. Everything seemed to be going smoothly now and we were on our way. Wait, I think I hear a discussion; yes, I know that I hear a discussion. Another gaggle!

As the voices crackled over the VHF I heard, "No, I'm not going to clear boondoggle 36 for takeoff; it's your job." "Ground control to tower, oh, no, pal, it's your responsibility to clear the aircraft for takeoff." I couldn't believe my ears. Then the AC gets into the act, and after a three-way conversation, sort of yells at me and then calls departure control, explains the problem between ground and tower and requests a VFR departure on course. With the help of departure control, (there was no aircraft inbound because the hold that we were placed on) we departed VFR on course and obtained our IFR once airborne.

The rest of the flight was uneventful.

I will have 20 years service in April '79; I have been on many trips during that time, but I have never, in these 20 years, observed such a mess from show time until final departure was made. It displayed complete disorganization and apathy. Get 'um.

Ed. Note: This letter was received after the author saw the base in question on our Rex Riley list. Only the names have been removed to protect the guilty. If the shoe fits. . . .

CLASSIFIED MATERIAL

Just wanted to send congratulations on revitalizing the program. We in the Base Ops business believe in taking good care of the crews—they're #1 in our book!

One subject which has come up recently is the ticklish item of "classified documents" carried by aircrews. I think it's worth the reminder to Base Ops and airfield mgmt types that they need to cross-check their plan for receiving a transient crew carrying classified. A variety of options exist, but the point is—HAVE A PLAN!

Not so SECRET

READ THE SUPP

I've just read some really bad "aircrew evaluation" forms and feel some of the info is worth passing on. We are one of the increasing number of airfields whose "Operating Hours" and "Transient Services Available Hours" *don't* match! An aircrew should note this when they peruse the IFR Supp. but if they don't, they could arrive at our house and find nobody to guide them in, chock their machine or provide any other necessary services. Flying machines with numerous bodies could probably handle the situation, but a single seater without parking brake would be outta luck. Not only could be a bother, but maybe downright unsafe. The moral of the story is read the fine print and compare the times—just because we are open doesn't mean we will have transient services!

Down South Airfield Manager

Dear Down South,

Hadn't thought about that lately myself! Thanks –that's the kind of info maybe we can use to prevent one of those dumb ground/taxi mishaps! ★

When It

The name of the game i
is prevention of mishap
ever, periodically we r
vestigate a "smoking hole.
is accomplished by the safety
gation board. Not all officers
the Air Force will serve in
pacity, but those selected
prove on the quality of the
gation by ensuring they have
understanding of how the in
tion is conducted and why
vestigation is taking place.

The safety investigation bo
ally arrives at the scene with i
bers somewhat perplexed and
asking, where do we go fro
There are two primary reason
turmoil. For one, this is the f
the board members have b
gether and second, this is p
the first time for each board

urn On The

RD

Richard J. Miller, Jr.
rate of Aerospace Safety

< at a "smoking hole." Thus, time is required to resolve the l and organization to take place board can begin working as a

rder to reduce this time to a um, each wing/base safety hould have a training program iliarize each board member vestigation requirements. This should start by answering the ns of how and why the investi-s being conducted. Don't get in the trap (we all are) that just more ground training or e attitude that "They won't as a board member," because y you are one, wondering u are supposed to look for.

"do's" that should be cov-ring the orientation:

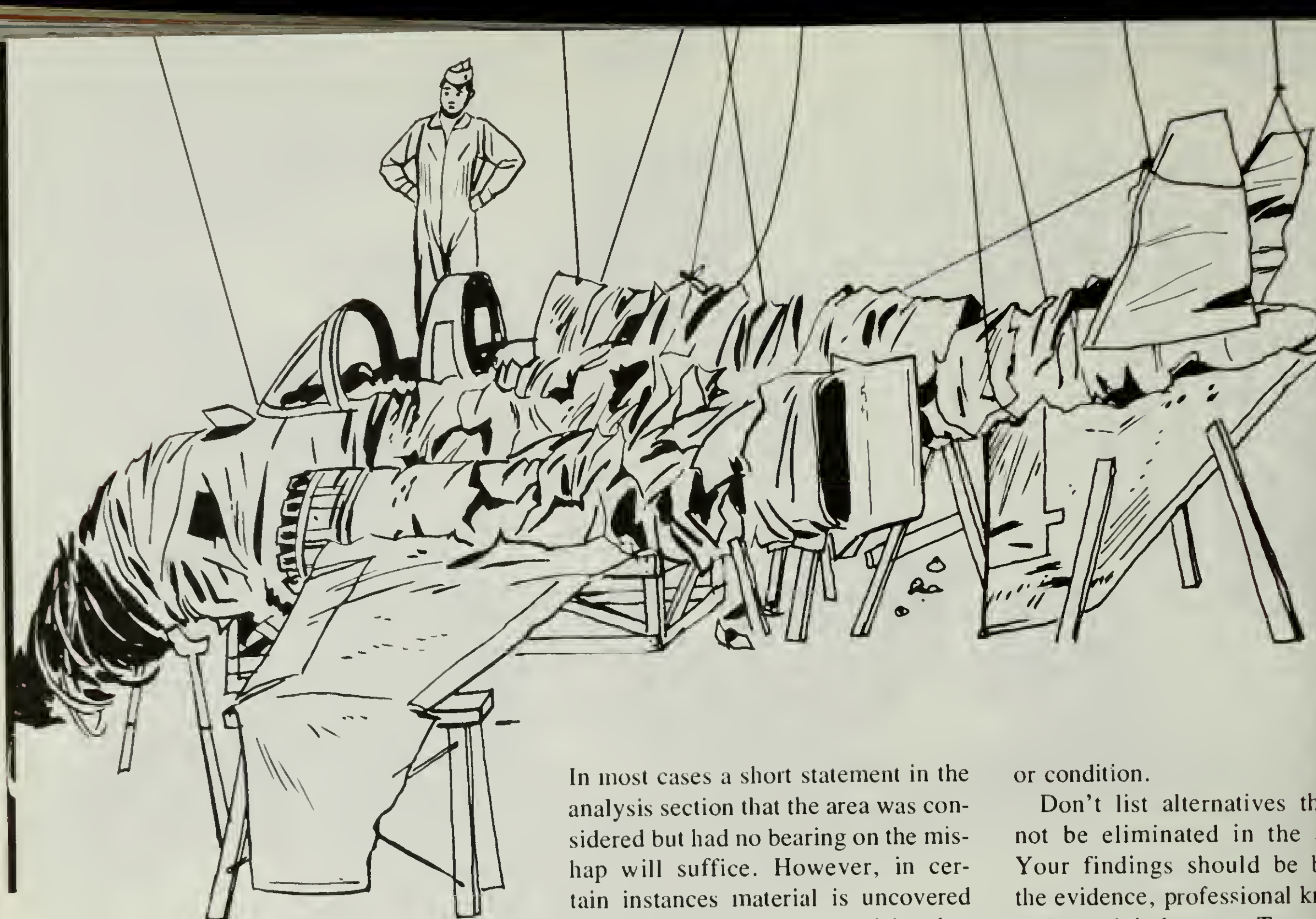
n of attack for each board member.

- How to conduct a walk-through of the mishap site.
- Record impoundment.
- How to obtain witness statements (and the reliability of the witness).
- Obtaining technical assistance from resources outside the MAJCOM.
- How the report is written. Why the two-part report. What should be contained in the Part II of the report (with particular emphasis on Tab W, Technical and Engineering Evaluations of Material that Contain Conclusions)?
- The open mind. No snap judgments.
- Findings and recommendations.
- AFR 110-14 and the safety investigation board.
- Electronic reports and administrative organization of the board.
- Contact point of the MAJCOM and their requirements.

Those personnel appointed to the safety investigating board will probably arrive within a day of the mishap. Initial steps should have been taken by the nearest Air Force facility (disaster preparedness plan) to provide aid to the injured, control the fire, secure the area, determine the status of any explosive components on board the aircraft, initial reporting and impoundment of records. The safety board should receive a briefing of what has been accomplished by the interim board and an initial walk-through of the mishap site. At this time, the knowledge gained during the safety board orientation should be put into effect.

During the investigation, remain impartial. Let the evidence lead to a logical conclusion. Evaluate the data obtained from the technical assistance provided. Several blind alleys will be entered but each should be pursued to a conclusion to resolve the question, did this have a bearing on the mishap?

An area of concern in many investigations is what to do with material that has no bearing on the mishap.



When It's Your Turn on The Board continued

In most cases a short statement in the analysis section that the area was considered but had no bearing on the mishap will suffice. However, in certain instances material is uncovered that is not germane to the mishap but may warrant corrective action if the board president so feels. Do not include these findings as part of the mishap findings. Separate correspondence addressing these findings should be forwarded to the headquarters convening the safety investigation board for their review and action.

The development of the findings and recommendations are products of the board's conclusions and will be the most difficult portion of the report to compose. Remember, findings must be completely substantiated within the analysis of the report. The all cause system places weight on the chain of events which resulted in the mishap. The findings (each finding does not have to be a cause) should be listed sequentially. Each finding is logically connected to the preceding and following finding. However, in those instances where technical data deficiencies and crew rest are identified as initial findings they will not link sequentially with the next finding. The finding should be a clear statement of a single event or condition.

Don't list alternatives tha
not be eliminated in the ar
Your findings should be ba
the evidence, professional kno
and good judgment. Test th
ings by linking them sequent
previously discussed (remem
the exceptions above).

Finally, cause should be a
those findings which singl
combination with other cau
sulted in the damage or inj
occurred. Causal findings are
omission, condition or circu
which corrected, elimina
avoided would have preven
mishap. (This is the test that
be applied to all causal fin
And finally, the recommen
made by the board must be
and related to the causes of t
hap. *If you do not have*
ommendation, don't mak
(AMEN!)

In conclusion, the safety
tigation board has an extrem
portant function in reducing
of manpower and equipment
feasible and workable correct
ommendations. The basis for
safety investigation begin
your name is initially placed
unit mishap investigating ord
your homework. You're next

programmed to trust

Major Roger L. Jacks • Directorate of Aerospace Safety

During the twentieth technical conference of the International Air Transport Association, Pan American World Airways put forth an intriguing observation about the pilot's role in modern day flying. Even though the conference took place three years ago, I think Pan Am's observations are worth repeating.

The pilot's role in today's structured world is that of a trusting ... In an era of specialization, the pilot must rely on scores of others to do their jobs. For example:

- After a brief review, he accepts the weight and balance form as being accurate.
- In some aircraft, he assumes the loadmaster has secured everything in its proper place.
- In other aircraft he is told that gear pins have been removed and all panels are secured.
- Ground marshallers tell him that he is clear of obstacles that could damage his aircraft.
- Tower controllers tell the pilot when to move, where to taxi, etc.
- He takes off on a runway selected for him.
- He follows headings, speeds and altitudes dictated by others.
- He depends on fellow crew members for the accomplishment of critical tasks.
- Nearing destination he is advised when to start descent, the altitude to fly, the air speed to hold and the headings to fly.
- He lands on a runway someone else selected—and is once again told where to taxi and where to park the aircraft.

And so the life of a pilot goes; ... trusting his life and his aerospace machine to the care of others. Pan American officials state that pilots are programmed to *take* orders. "In the routine situations he has virtually no need to *give* orders. His environment—the "system"—has programmed him not to make decisions." And yet when he is behind the yoke or stick, the total responsibility is his. "The only ultimate authority is his."

"Though he has been heavily programmed to trust, he is expected to take positive corrective action at any moment if required. And the requirement may be subtle: an incorrect heading, an incorrect altitude, a change in wind direction or velocity affecting acceptable weights, loads, or fuel required, a NOTAM overlooked by a dispatcher, a misunderstanding between controller and pilot as to the responsibilities of each. There are many such subtle, creeping, potentially anomalous situations which may and do arise."

Even though the pilot has been psychologically conditioned to accept the dictates of others, his command or assertive behaviour must stand ready to be triggered when his mental faculties detect something going astray. He must at the proper time override his conditioned response to follow the instructions of others and assert himself as the ultimate authority. Pan Am suggests this is a more difficult and demanding task than it may seem. Reliance and trust in others can breed complacency in the unsuspecting pilot.

Many a mishap might have been avoided had a pilot's normal warning reactions not been blocked by his programmed trust. How many mishaps have been caused by programmed trust distorting a pilot's perception of the situation? A quick look at some classic examples that occasionally repeat themselves provide our answer. The pilot who has been cleared for an approach but is given an incorrect level off altitude. With blind, unquestioning reliance, he flies his aircraft into the mountain. Or the pilot who, while routinely flying an approach with a low ceiling, struck the ground short of the runway . . . the voice recorders tell us the crew had such confidence that everything was going as planned that they were casually talking about politics at the time of the mishap.

Trust and faith in the system; we're not knocking that—that's written into the pilot's contract. It is a basic part of flying! What we are saying is unquestioning, irrational trust is not part of the deal!!

Human factors are what we're really discussing in this article. It is an important subject since most of our mishaps are caused by them. Pan American's observations are certainly a noteworthy consideration when pondering the many ways the human factor affects our mishap rate. Make your crews aware of the "Programmed to Trust" syndrome. ★

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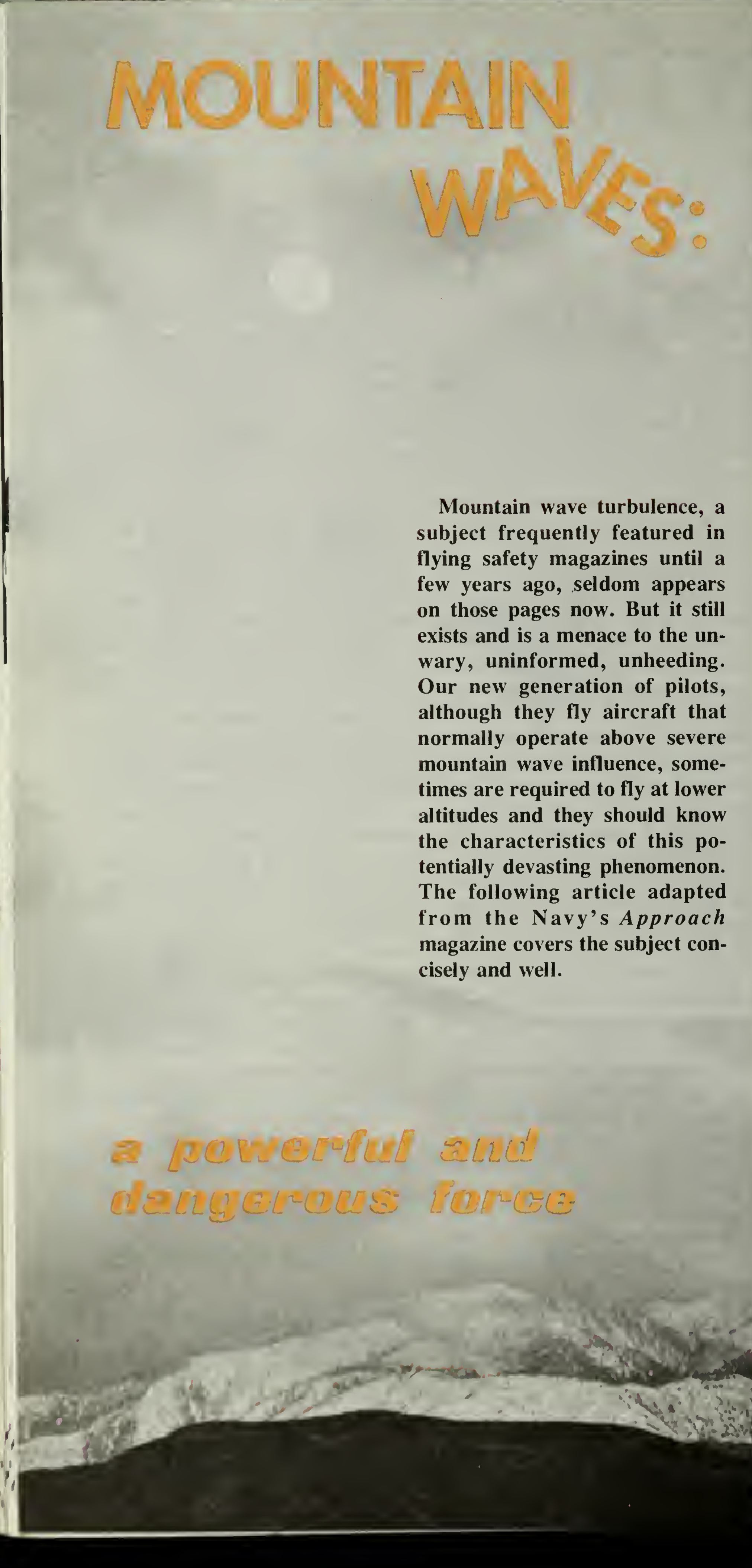
Safety in Flight Operations, 20th Technical Conference, International Air Transport Association, The Changing Role of the Pilot: Command 1975 *Pan American World Airways.*

MOUNTAIN WAVES:



Mountain wave turbulence, a subject frequently featured in flying safety magazines until a few years ago, seldom appears on those pages now. But it still exists and is a menace to the unwary, uninformed, unheeding. Our new generation of pilots, although they fly aircraft that normally operate above severe mountain wave influence, sometimes are required to fly at lower altitudes and they should know the characteristics of this potentially devasting phenomenon. The following article adapted from the Navy's *Approach* magazine covers the subject concisely and well.

a powerful and dangerous force

A T-39 was flying a lov high-speed navigationa ing route in mountain rain when it encountered sev bulence. Gust acceleration loa so high that aircraft design were exceeded, resulting in tion of the tail assembly from craft. The plane flipped i from its 500-foot altitude and c killing all five crew members. tain waves – the result of win ing over mountainous terrain identified as the cause of the turbulence. The crew's perf VFR weather brief and their understanding and awaren mountain air turbulence con to this tragic accident. Indeed tain waves are a significant that demand aircrew knowle caution whether you are flying props, or jets.

Mountain waves – also kn lee or gravity waves – are p when normal windflow is dis by a mountain or substantial high ground. Mountain wave patterns (Fig. 1) result in wav ing for miles downwind of the tain ridge. Wave lengths ma long as 30 miles, with the wave being about 5 miles. larger mountains produce waves, turbulence associate windflow interruptions ca from relatively small hills or

Hazards to aircraft exist du extreme turbulence and the downdrafts and updrafts ass with mountain waves. The area of turbulence is found "rotor Zone" (Fig. 1) located the crest of the waves. The ma of the vertical currents is de on the height of the mountai surrounding terrain. Large tains can produce currents wit in excess of 5000 fps – obvio ards to the low flier.

Mountain waves are most l be found when the following tions exist:

- A marked stable airmas temperature change with a through some layer of the atm on the windward side of the

Fig. 1 Typical mountain wave pattern and associated clouds

Wind blowing perpendicular to mountain or ridge, and the direc- of the wind remaining mostly tant with height.

Windspeeds in excess of 20 s, and windspeed increasing with nt.

though waves are most likely to in these conditions, they can be formed in other circumstances.

e waves can often be detected e characteristic lenticular (dou- onvex) clouds which may form e wave crests (although these acteristic clouds may be ob- d by other clouds). Also, moun- and ridge lines where snow or ng sand and dust are seen rising e crest give the pilot a clue about xistence of gravity waves. If conditions are sighted in con- ion with the conditions de- d (as received in the weather deviation around or over the ain area is the prudent action.

v high must an aircraft pass to avoid the effect of gravity waves? While turbulence caused by extreme mountain waves can extend into all altitudes that our aircraft use, dangerous turbulence can usually be avoided by clearing the mountains at least half again as high as the AGL height of the mountain. Thus, a 4000-foot mountain located on terrain 2000 feet above sea level should be overflown at a minimum of 8000 feet MSL (4000 x .5 + 6000 MSL = 8000 MSL). This formula is designed to reduce the risk of entering the turbulent rotor zone and will not necessarily give sufficient margin to allow for height loss caused by downdrafts.

The pilot who finds himself inadvertently in a mountain wave situation should take the following action:

- Slow to recommend speed for turbulent air.
- Disengage autopilot altitude hold, if applicable, to avoid the possibility of stalling in a downdraft.
- Fly attitude if turbulence is encountered.
- Alter the route of flight by climbing, not flying parallel to ridge lines, or circumnavigating if feasible.

Mountain waves should never be taken lightly. In addition to the T-39 crash, mountain waves have been identified in the loss of or extensive damage to a number of aircraft. While this type of turbulence is obviously critical to traditional low fliers like helicopters, all aircraft are susceptible.

As with thunderstorms, avoidance of mountain waves is the best flight technique. Understand what conditions produce mountain waves, get a thorough weather brief, and be alert for visual indications of mountain waves. Perhaps the single most easily recognizable clue that mountain turbulence can exist is the presence of strong surface winds (in excess of 20 knots). The stronger the winds, the more likely the turbulence. If mountain waves look likely, circumnavigate or climb over the mountains using the altitude formula. Mountain waves can spell disaster for the uninformed or the unwary. ★

Airport Qualification Program

Following a recent article mentioned the Airport Qu tion Program Slide-Tape we were deluged by calls. the most current list we cou Order them thru your Bas Library. Questions? Call Harry Culler, Chief, Airport fication at AAVS, AUTOVO 3257.

COMPLETED PROGRAMS

ISD-Q5- 047 Norton AFB
059 March AFB
060 George AFB
ISD-Q6- 346 Barbers Point NAS, HI
348 Beale AFB
353 Cubi Point NAS, PI
354 El Toro MCAS
356 General Lyman, HI
357 Guantanamo Bay, CU
360 Hickman AFB, HI
362 Howard AFB, CZ
363 Fukuoka AB, JA
364 J.F. Kennedy, Bolivia
365 Kaneohe Bay NAS, HI
366 Kirtland AFB
369 Mather AFB
370 McClellan AFB
377 Sandrestrom, Greenland
437 Jan Smuts, UA
441 Dakar, SK
442 Ascension AUX AF, Ascension Island
445 Pudahuel, CI
447 Carrasco, UY
448 Presidente Stroessner, Paraguay
449 Charleston AFB
450 Dover AFB
451 McGuire AFB
452 Travis AFB
453 McChord AFB
454 Hill AFB
455 Pope AFB
456 Dyess AFB
457 Little Rock AFB
458 Andrews AFB
459 Robert Gray AAF
460 Campbell AAF
461 Altus AFB
462 Norfolk NAS
466 Eielson AFB
467 Yokota AB, JA
469 Iwakuni AB, JA
470 Osan AB, KO
471 Kunsan AB, KO
473 Anderson AB, Guam
476 Pago Pago, American Samoa
477 Richmond, AT
479 Christchurch, NZ
597 Buckley ANGB
598 Peterson Field
599 Scott AFB
723 Alameda NAS
819 Bergstrom AFB
ISD-QT- 839 Perth AT
840 Learmonth Aprt, AT
841 Alice Springs, AT
842 Amberly RAAF, AT
843 Ohakea RNAFB, NZ
ISD-Q7- 904 Keesler AFB
905 Kadena AB, JA
906 Taegu AB, KO
910 Wainwright AAF, AK
911 Cape Newenham AFS, AK
912 Cape Romanzof AFS, AK
913 Sparrevohn AFS, AK
914 Indian Mountain AFS, AK
916 Seneca AAF
917 Toncontin Aprt, HO
918 Mariscal Sucre Aprt, EC
960 Tatalina AFS, AK
1309 Kwang-Ju, KO
1311 A-306, KO
1312 Hoengsong, KO
1313 Kimhae Intl, KO
ISD-Q8-1397 Cagayan de Oro, PI
1403 R-407, KO
1404 Kangnung, KO
1405 Cheju, KO
1500 Offutt AFB
1501 Pease AFB

IN PRODUCTION

ISD-Q6- 355 Elmendorf AFB, AK
368 Lajes, Azores
414 Prestwick AB, Scotland
415 Templehof AB, GE
417 Ramstein AB, GE
465 Shemya AFB
ISD-Q7-1056 Adak NS, AK
ISD-Q8-1544 Lakenheath, UK
1549 Los Angeles Int'l
1611 Upper Heyford, UK

PROGRAMS PLANNED FOR FUTURE PRODUCTION

ISD-Q6- 345 Aviano, IT
347 Bardfoss, NO
352 Clark AB, PI
361 Hong Kong
373 Moffett Field NAS
374 Nicosia, CY
375 Ping Tung AB, Taiv
376 Galeao, BR
379 Tainan, Taiwan
380 Taipei, Taiwan
381 Thule AB, Greenlar
411 Torrejon AB, SP
412 Rota NAS, SP
413 Mildenhall AB, Engl
416 Frankfurt Main, GE
418 Pisa AB, IT
419 Naples NAS, IT
420 Athens, GR
421 Beirut, LE
422 Incirlik AB, TK
423 Dyabikar, TK
424 Trapezon, TK
425 Cigli, TK
426 Samsum, TK
427 Ben Gurion Intl Airport, IS
428 Amman, JO
429 Cairo, EG
430 Daharan, SR
431 Tehran, IR
432 Addis Ababa, ET
433 Asmara, ET
434 Bahrein Island
436 Sigonella, IT
438 Roberts Field, LI
439 Kinshasa, CX
440 Nairobi, KE
443 Jorge Chavez, PE
444 Ezeiza, Argentina
446 Brasilia, BR
463 Goose AB, Labrado
464 Keflavik AB, Icelanc
468 Misawa AB, JA
474 Wake Island
475 Johnson Island
ISD-Q7- 915 Cape Lisburn AFS,
919 Midway NS, Midwa
920 Coolidge Aprt, Antig
959 Galena AFS, AK
961 King Salmon, AK
962 Tin City AFS, AK
1310 R-222, KO
1314 R-404, KO
ISD-Q8-1550 Kelly AFB
1551 Barksdale AFB
ISD-Q9-1634 Nellis AFB ★

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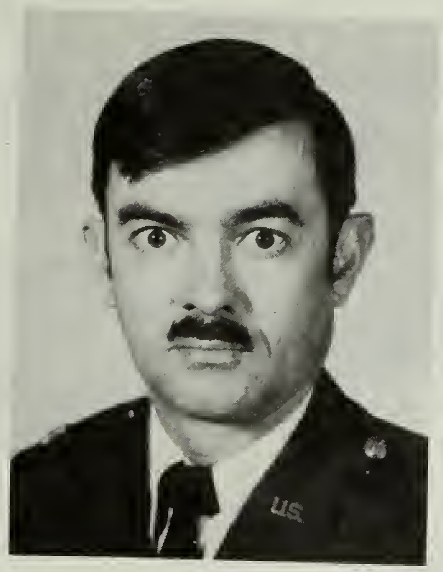


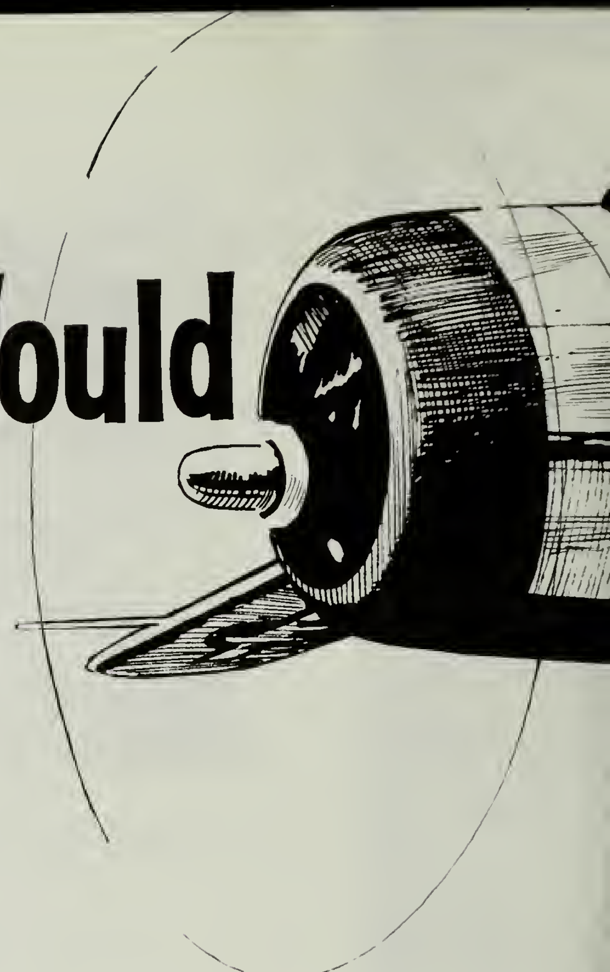
MAJOR
RAYMOND D. FOWLER

CAPTAIN
DAVID J. McCLOUD

64th Fighter Weapons Squadron
Nellis Air Force Base, Nevada

On 28 March 1978, Major Fowler and Captain McCloud were engaged with four F-15s in a training mission near Eglin AFB, Florida. Major Fowler was on his last mission in the F-5E Aggressor upgrade syllabus. Captain McCloud was the instructor pilot and was flying the lead aircraft. The two pilots were in a left turn, at 20,000 feet and 1.2 mach when the canopy on Major Fowler's aircraft suddenly shattered. Major Fowler was severely injured by flying plexiglass which caused the loss of his right eye and greatly impaired the sight of his left eye due to profuse bleeding and extreme wind blast. He immediately recovered his aircraft, initiated distress calls, gave a position report to his flight lead, and turned to a heading toward base. Captain McCloud who at the time of the occurrence was approximately 1 NM ahead of Major Fowler, effected a rejoin while directing and coordinating emergency recovery procedures with the controlling agencies and the Eglin AFB Command Post. Captain McCloud gave timely and accurate instructions on altitude, attitude, airspeed and heading to effect the safe recovery of his wingman, whose ability to distinguish outside references was severly limited. In spite of severe pain and being in a state of shock, Major Fowler demonstrated exceptional composure and airmanship while simultaneously maintaining aircraft control and responding to information provided by his flight lead. Major Fowler executed a perfect landing, taxied clear of the runway, and completed post landing procedures prior to being helped from the airplane. The superior airmanship and flight coordination of Major Fowler and Captain McCloud, under the most serious conditions, prevented possible loss of life and the loss of a valuable aircraft. WELL DONE! ★

As Luck Would Have It



Lt Col Robert D. Sharp, AFRES (Ret)

Since the event related here, we hope we have become smarter, better disciplined and more professional. We owe a lot to those who in the younger days of aviation learned the hard way. Perhaps by repeating some of their "war stories" we can avoid some of the pitfalls of misguided pilot ego.–Ed.

Numerous stories are told of T-bolts coming home with a couple of jugs missing or a four foot hole in the wing. I'm sure they're all true because the old girl brought me back with no oil pressure and enemy inflicted wounds more than once.

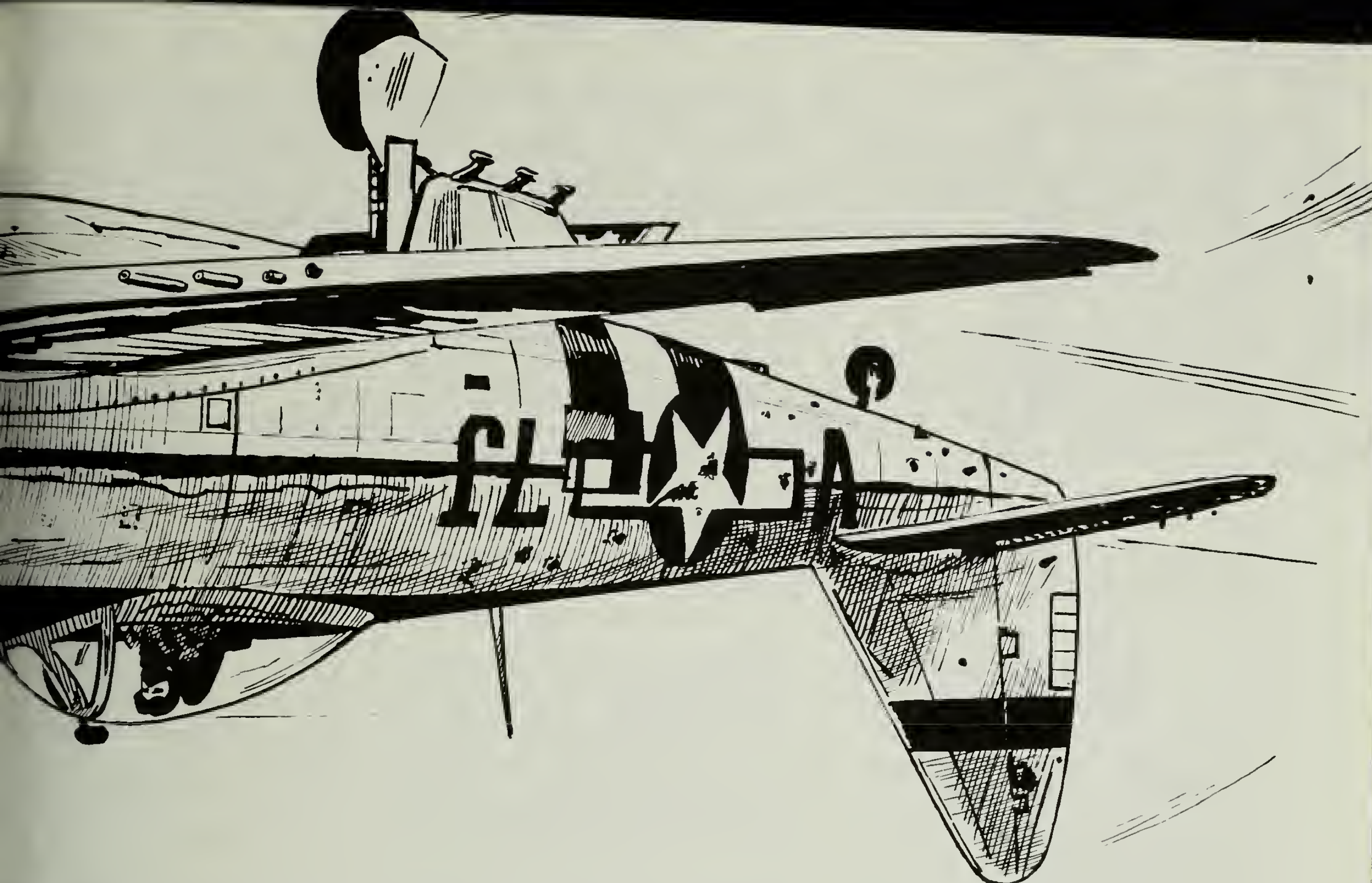
But all flying problems were not enemy initiated.

If you fly enough, you will sooner or later commit the "big one" and whether you live or die could depend to a great extent on how forgiving your aircraft is. Fortunately for me, the P-47 was very forgiving.

One event happened this way. I was returning from a mission in the E. T. O. (European Theatre of Operations) having sustained a slight amount of flak damage. I had become separated from the squadron and returned to the base alone. The weather was not good and it was late in the afternoon, though the rain and darkness was not particularly relevant. Everything else seemed right.

As you remember, competition in the hot-pilot department was fierce amongst fighter jocks and the landing pattern (because of the near-continual audience) was a great place to show your wares. (I recall the day at Harding Field, Louisiana, when the late Major Bong brought in a P-38 and pulled contrails off the wing tips from peel-off to near touchdown. We neophyte pilots had tried all day to get contrails off the 47 to no avail.)

Well, this day in Fran crossed the end of the runway on initial appro at 350 mph and 500 ft altitude, preparatory to grand entrance and my display of excellence, bordering on superiorit rolled into a near 90 de left bank, chopped the throttle and honked ba the stick, moved the pi and mixture controls forward, started the ge and flaps down, opene engine cowl flaps, igno the crosswind and wait All went well until comi around on final approa when I appeared to be shooting the runway to right. (This due to the l crosswind that I previo ignored.) Still in a near



gree bank and determined land on the first try, I led back on the stick der to try to bend the Jug und and get it lined up h the runway. I continued violate all the rules of elligence as I put in some tom (left) rudder to posedly help the turn.

rom there on nature took r as the aircraft snap- ed to the left.

ell, I was all over that kpit with arms and legs king corrective actions. I ed off on the stick, lied opposite rudder and t aileron, and added e power all at the same , stopping the snap-roll n the Jug was nearly de down. The airplane rolled right to a near e-point attitude just as it he ground. Luck (or the ator) took charge as the raft hit somewhere nd the runway in a not-too-well-controlled crash, heading some 30 degrees to the right of the runway heading.

Immediately, the aircraft was off the side of the runway and on the grass. I hit the brakes and held the stick full back with both hands. The subsequent skid took that airplane across the grass, through a pile of sand and toward a short stack of what looked like railroad ties. That machine went through the lumber like it was paper, with wood flying everywhere. The airplane continued to skid and finally came to rest a few feet from the on-field fire house and fire engine, thereby climaxing the unusual ride. Luckily, the weather and time of day reduced an otherwise appreciative and attentive audience to near zero.

SOME WAYS PILOTS DIE . . .
Stretch the glide!
Tighten the pattern!
I can't wait for better weather, I've got to get home tonight!
We've got plenty of gas!
Close it up. We'll break out in a minute!
Who needs a checklist?

A subsequent hard-landing-and-obstacle-course inspection revealed no aircraft damage resulting from the substandard approach to the parking mat.

I haven't stopped all my stupid acts, but periodically I think of this near wipeout 34 years ago and cringe. I try to blame it on my youth to convince myself that today I'm smarter.

I eventually moved into other aircraft (F-51, F-80, T-33 and F-86) aware that the lessons learned in the P-47 were invaluable. ★

Mail & Miscellaneous

Send your ideas, comments, and questio[n]
Editor, Aerospace Magazine
Norton, AFB, CA 92409

GLAD TO HELP!

I am writing this letter to request ten copies of the *Aerospace Safety* magazine for Davison Army Airfield. As the new airfield safety officer, I noted that we were receiving the *TAC* magazine and the *USAF/Naval Safety Journal,* but not *Aerospace.* The unit I just departed received this publication regularly and I found it quite informative. . . .

JAMES T. BLAKE, CPT. MI
Davison U.S. Army Airfield
Fort Belvoir, VA 22060

MINIMUM FUEL, EMERGENCY FUEL, OR EMERGENCY?

Your recent article on Minimum/-Emergency Fuel (p. 26, Sept 1978) highlighted a much abused and often disregarded procedure. There is a definite need for more pilots to become aware of the problems of the air traffic controller when dealing with the low-on-fuel pilot. During my last tour as an ATC Facility Chief I encountered all too often the situation of pride overcoming common sense and sound judgment. There seemed to be the feeling that by declaring Minimum Fuel, or worse, Emergency Fuel, the pilot was admitting to the world he has made a mistake and did not adequately flight plan his fuel requirements or waited too long prior to RTB. Now, this sense of pride and the resulting delay in advising ATC of a critical fuel problem puts the burden on the controller. Without any warning, he has an emergency fuel aircraft on his hands without the luxury of the time to sequence his traffic accordingly. Just because the term "minimum fuel" is related to "normal air traffic services" does not mean that it is of no use to the controller. AFR 60-16 states "use of the term alerts air traffic control that delays or deviations from normal handling may cause a reduction in fuel supply to the point where the aircrew must declare an emergency to obtain priority handling and ensure safe landing." Controllers are like pilots; they don't like surprises. They prefer to plan ahead as much as possible, especially during periods of heavy traffic. Keep them advised.

CLAUDE G. PETTYJOHN,
Capt, USAF
Flight Inspection and Operations Evaluations Pilot
1868th Facility Checking Squadron
APO New York 09057

JUST RELEASED

AFISC, in conjunction with AAVS, has just completed two more safety audiovisual shows of interest to aircrew personnel.

—TS 953, *Little Things Mean A Lot.* This 11½ minute, color 16mm film depicts the many ways Foreign Object Damage is one of our biggest problems in the Air Force today.

—TS 752, *Approach and Landing.* This 15½ minute, slide/tape show is designed to reinforce aircrew understanding of their ability to cope with the principal hazards associated with the approach and landing phase of flight.

You can order these shows through your base film library. Good viewing!

JUDGMENT AND THE FLYING SAFETY PROGRAM

1. This letter is submitted as an attention getter and point to ponder for those who fly and maintain aircraft. Although the particular aircraft involved was a T-38, I believe son learned applies across th to those tasked to insure th tional integrity of aircraft.

2. The aircraft of intere scheduled for an FCF follow tensive maintenance. During th 781 review prior to flight, t noted that one of the main win had been identified for six s and individual cracks. The w were signed off because all the were individually within acc TCTO limits and the aircraft wa fore released for flight. Th turned down the aircraft on th that the cumulative effect of of cracks had not been dete His actions were based on i only! As it turned out, he wa but it took a second look an head scratching to determine structural integrity was indee promised by these cracks.

3. I certainly hope that the learned is not perceived inc or construed as an Ops vs nance problem. The point is th in the speciality oriented, sign-off working environme characterizes the work-a-d Force, every individual is an e member of the safety team. Eve ation is not and cannot be cov TCTO. A helpful questioning is an invaluable tool in identifyi problem areas or something t "doesn't look right." Neither mean that we can resort to and guess" to maintain and the fleet! Intuition tempered b ment is important and should couraged for the betterment entire safety program. ★

JOHN R. WITTME
Captain, USAF
Flight Safety Offi
Armament Devel
& Test Center
Eglin AFB, FL

PILOTS RATE SAFETY FACTORS

onel Norman DeBack, USAFR
ctorate of Aerospace Safety

*ne real poop
 how to fly
fely and live
 collect
irement.*

ecently United Airlines, conducting a study on Flight Safety, asked their retired pilots to re- to a questionnaire of some 29 rent aspects related to safety. is a report, then, by some of nost experienced and least in- d people that ever have flown.

The relative importance to safety of flight and the average grade on a scale of 10 - 0 was:

Planning ahead	9.32
Everything grooved at the outer marker	9.16
Knowledge of aircraft performance	8.94
Cockpit coordination	8.90
Attitude	8.84
Flying skill IFR	8.82
Adherence to SOP	8.52
Flying skill VFR	8.20
Attention to detail	8.18
Knowledge of airports and facilities	7.40
Knowledge of Meteorology	7.4
Knowledge of aircraft systems	7.02
Knowledge of SOP	6.32

The single most important consideration:

lanning ahead	23%	Attention to detail	3%
ttitude	17%	Total attention	3%
ockpit coordination	9%	Self-confidence	3%
ying skill IFR	7%	Know your limitation	3%
lertness	7%	Take nothing for granted	3%
ofessionalism	6%	Fatigue	2%
dgment	5%	Adherence to SOP	2%
ying skill VFR	5%		
owledge of aircraft performance	4%		

Human frailties that caused the most exposure to accident:

Complacency	52%
Distraction	32%
Illusion	7%
Fatigue	7%
Anger	4%
Ego	2%

Also listed were:

- Failed to plan ahead
- Over-confidence
- Boredom
- Carelessness
- Disorganized cockpit
- Failed to work as a team

Planning ahead received the highest grade and also leads as the most important single factor. Attitude, cockpit coordination, and flying skill IFR were also rated high on both lists. Like patriotism and motherhood, these are easy to agree with and are certainly viable today.

As for the negatives—the human frailties that caused exposure to an accident—*complacency* was listed by over one-half and *distraction* by one-third of those responding. It is interesting to wonder how *complacency* could have been a problem in the uncomfortable, unsophisticated airplanes of the past, but it was listed by many who did not fly jets.

Colonel DeBack is a pilot for United Airlines and a member of the AFRES assigned to AFISC. ★

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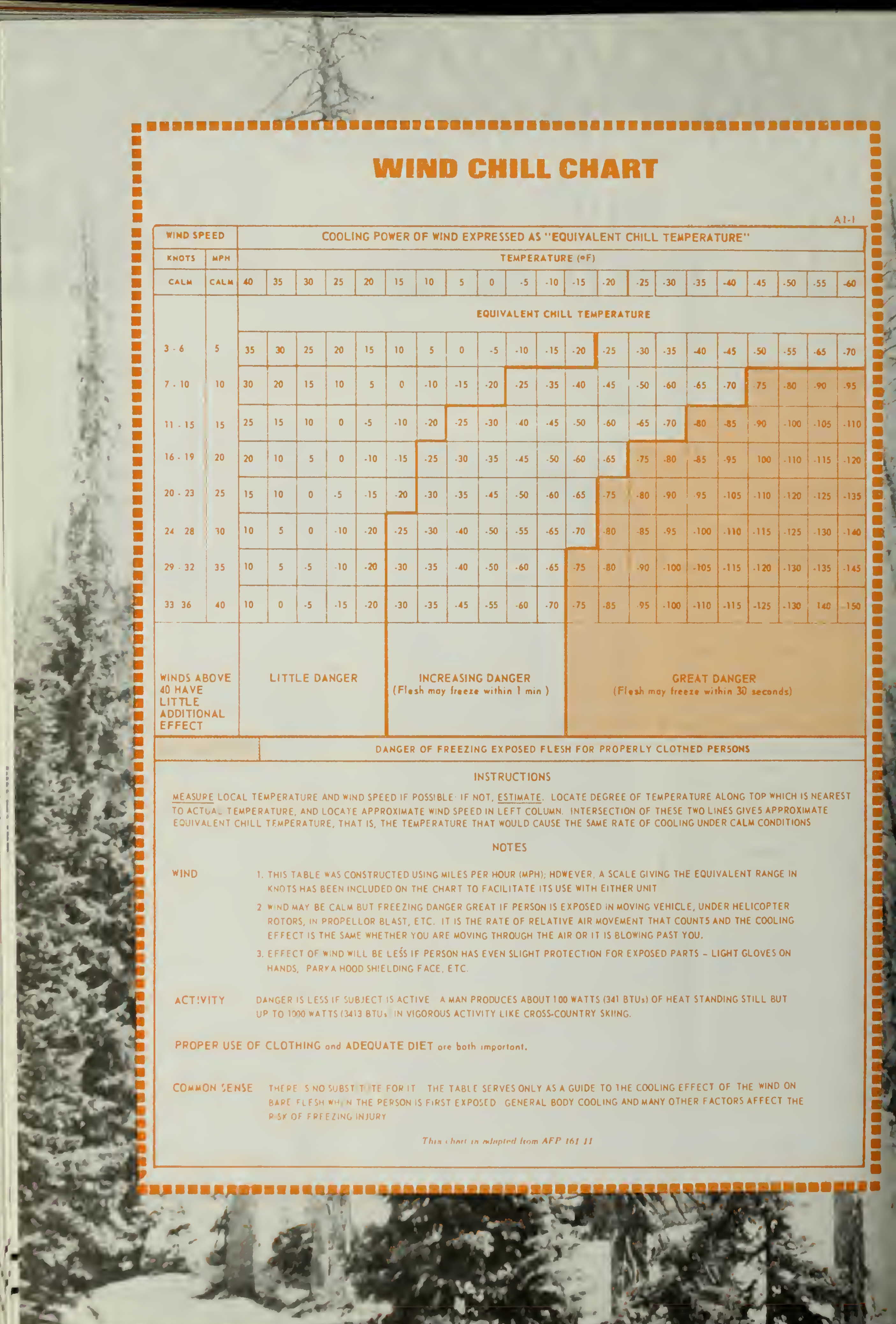

WIND CHILL CHART

WIND SPEED		COOLING POWER OF WIND EXPRESSED AS "EQUIVALENT CHILL TEMPERATURE"																				
KNOTS	MPH	TEMPERATURE (°F)																				
CALM	CALM	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	-60
		EQUIVALENT CHILL TEMPERATURE																				
3 - 6	5	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	-65	-70
7 - 10	10	30	20	15	10	5	0	-10	-15	-20	-25	-35	-40	-45	-50	-60	-65	-70	-75	-80	-90	-95
11 - 15	15	25	15	10	0	-5	-10	-20	-25	-30	-40	-45	-50	-60	-65	-70	-80	-85	-90	-100	-105	-110
16 - 19	20	20	10	5	0	-10	-15	-25	-30	-35	-45	-50	-60	-65	-75	-80	-85	-95	100	-110	-115	-120
20 - 23	25	15	10	0	-5	-15	-20	-30	-35	-45	-50	-60	-65	-75	-80	-90	-95	-105	-110	-120	-125	-135
24 28	30	10	5	0	-10	-20	-25	-30	-40	-50	-55	-65	-70	-80	-85	-95	-100	-110	-115	-125	-130	-140
29 - 32	35	10	5	-5	-10	-20	-30	-35	-40	-50	-60	-65	-75	-80	-90	-100	-105	-115	-120	-130	-135	-145
33 36	40	10	0	-5	-15	-20	-30	-35	-45	-55	-60	-70	-75	-85	-95	-100	-110	-115	-125	-130	140	-150
WINDS ABOVE 40 HAVE LITTLE ADDITIONAL EFFECT		LITTLE DANGER					INCREASING DANGER (Flesh may freeze within 1 min.)						GREAT DANGER (Flesh may freeze within 30 seconds)									
		DANGER OF FREEZING EXPOSED FLESH FOR PROPERLY CLOTHED PERSONS																				

INSTRUCTIONS

MEASURE LOCAL TEMPERATURE AND WIND SPEED IF POSSIBLE; IF NOT, ESTIMATE. LOCATE DEGREE OF TEMPERATURE ALONG TOP WHICH IS NEAREST TO ACTUAL TEMPERATURE, AND LOCATE APPROXIMATE WIND SPEED IN LEFT COLUMN. INTERSECTION OF THESE TWO LINES GIVES APPROXIMATE EQUIVALENT CHILL TEMPERATURE, THAT IS, THE TEMPERATURE THAT WOULD CAUSE THE SAME RATE OF COOLING UNDER CALM CONDITIONS

NOTES

WIND

1. THIS TABLE WAS CONSTRUCTED USING MILES PER HOUR (MPH); HOWEVER, A SCALE GIVING THE EQUIVALENT RANGE IN KNOTS HAS BEEN INCLUDED ON THE CHART TO FACILITATE ITS USE WITH EITHER UNIT
2. WIND MAY BE CALM BUT FREEZING DANGER GREAT IF PERSON IS EXPOSED IN MOVING VEHICLE, UNDER HELICOPTER ROTORS, IN PROPELLOR BLAST, ETC. IT IS THE RATE OF RELATIVE AIR MOVEMENT THAT COUNTS AND THE COOLING EFFECT IS THE SAME WHETHER YOU ARE MOVING THROUGH THE AIR OR IT IS BLOWING PAST YOU.
3. EFFECT OF WIND WILL BE LESS IF PERSON HAS EVEN SLIGHT PROTECTION FOR EXPOSED PARTS – LIGHT GLOVES ON HANDS, PARKA HOOD SHIELDING FACE, ETC.

ACTIVITY DANGER IS LESS IF SUBJECT IS ACTIVE. A MAN PRODUCES ABOUT 100 WATTS (341 BTUs) OF HEAT STANDING STILL BUT UP TO 1000 WATTS (3413 BTUs) IN VIGOROUS ACTIVITY LIKE CROSS-COUNTRY SKIING.

PROPER USE OF CLOTHING and ADEQUATE DIET are both important.

COMMON SENSE THERE IS NO SUBSTITUTE FOR IT. THE TABLE SERVES ONLY AS A GUIDE TO THE COOLING EFFECT OF THE WIND ON BARE FLESH WHEN THE PERSON IS FIRST EXPOSED. GENERAL BODY COOLING AND MANY OTHER FACTORS AFFECT THE RISK OF FREEZING INJURY

This chart is adapted from AFP 161 11

AEROSPACE

AFETY • MAGAZINE FOR AIRCREWS

FEBRUARY 1979

THIS ISSUE

DDing the F-111

licopter Lightning

DLE EAST: Flight Safety And Survival

Care and Feeding of Attached Crew Members

FODing

THE F-III

Major Eugene LaMothe • Directorate of Aerospace Safety

In the past 2 years more than 80 TF30 engines in F/FB-111 aircraft were damaged sufficiently by foreign objects to require removal and repair. The cost was over $2 million, but equally important is the additional workload placed on the engine community. One of the limiting factors in F-111 sortie production during this time period was lack of engine availability due to the large number of TCTOs in work. The additional burden imposed by foreign object damage further limited the number of spare engines available and delayed the overall recovery program. This article will review F/FB-111 foreign object damages causes in the belief that we can learn from past mistakes.

There are three paths that foreign objects take reach an engine in the F/FB-111. The most obvi is the primary air intake that everyone respects a stays well clear of. Auxiliary air inlets (blow-in do and translating cowls) provide a second path that is as obvious and this may help explain why so many f eign objects enter through these inlets. Boundary la air louvers on top of the aircraft allow small objects reach the spike system and drop into the intake. Each these foreign object paths presents unique problems FOD prevention.

AUXILIARY AIR INLETS The large number foreign objects that have been ingested through these lets indicates personnel working around the aircraft not sufficiently aware of the hazard they represent. appears no one is immune to being surprised by the amou of air entering these inlets. In 1971, the first of 11 hea

TED STATES AIR FORCE

AEROSPACE

SAFETY MAGAZINE

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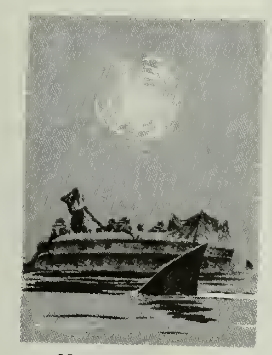
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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

TABLE I

F/FB-111 aircraft have experienced 240 reportable instances of foreign object damage since entering the inventory 10 years ago. In 113 of these, the objects causing the damage were identified and this information is summarized in Table 1. The numbers with asterisks represent incidents where the foreign object reached the engine through the auxiliary air inlets. The continuity in some of these columns indicates we haven't learned too well from past mistakes.

SUMMARY OF F/FB-111 ENGINE FOREIGN OBJECT JAN 1968 - NOV 19

HEADSETS	GEAR/ TAILHOOK PIN	WEAPONS PINS	ICE	COMM CORD/ GROUND CABLE	OTHER ITEM THREE OR M FOD OCCURI
* Jun 71	* Sep 71	* Jan 72	Mar 74	Sep 72	23 Fasteners
* Mar 73	Jul 72	* May 72	Mar 74	* Aug 74	3 Tools
* Mar 73	* Sep 72	* Jan 73	Mar 74	Dec 74	3 Intake covers
* Dec 73	* Feb 73	* Jun 73	Dec 76	Mar 76	4 Screws
* Sep 74	* Apr 73	* Jul 73	Dec 76	* May 76	3 Birds
* Apr 75	* Mar 73	* Feb 74	Jan 77		4 Bolts
* Mar 76	* Jun 73	* May 75			3 Pieces of spik
* Aug 76	* Apr 75	* Aug 76			3 Engine blind
* Oct 76	Jan 76				3 Rivets
Sep 77	* Feb 76				22 Miscellaneous
* Oct 78	* Aug 77				113 Total known
	* Dec 77				127 Unknown obj
					240 Grand Total

FODING THE F-III

sets that have been ingested by F-111s was lost by a supervisor of flying. He was checking the aircraft for hot brakes when his flight hat and ear defenders were snatched from his head. Objects have been lost by crew chiefs

The crew chief had installed the speedbrake collar in preparation for engine shutdown and was exiting the wheel well with the tail hook pin in his hand. He tripped on the main wheel chock and when he raised his hand to stop his fall, the engine sucked the pin from his hand through the middle blow-in door.

And engine shop personnel

An engine specialist, while exiting the wheel well area during the military rpm check of an engine trim operation, lost his headset and wool cap through the blow-in door of the left engine.

Who should have been aware of the hazards associated with these intakes? Other flight line personnel, such as munitions handlers

The aircraft was ground aborted and the weapons were being dearmed when two munitions personnel collided while passing each other between the intake and pylon station four. One airman dropped a BRU mechanical safety pin which was ingested through the open translating cowl.

And environmental technicians

Aircraft was being run at military power for an operational check of the heat exchanger and cooling turbine systems. The environmental mechanic attempted to enter the main wheel well to leak check the syste when his arm was drawn into the transla ing cowl opening. Two other personnel we able to pull him free, but were unable to prevent his headset from being ingested i to the engine.

It took two men to safely pull the environmental mechanic's from the suction through the translating cowl opening, but set wound up here.

have contributed to the problem. Transient alert nel at a cross-country base weren't aware of the

A transient alert crew chief installed grounding wire on the number four pyl and left the area to assist in parking tv other aircraft. The remaining crew chi who had not seen the ground wire being i stalled, requested the wings be swept to degrees to make more room on the ram During engine shutdown, with the win swept, the grounding pin and wire we

sucked into the engine through the blow-in doors.

Each of these instances points to the need for a con-ing education program that ensures everyone who s near an F-111 with engines running has the same pect for auxiliary intakes as they have for the primary kes.

PRIMARY INTAKES Watch an F-111 with engines ning on a humid day and you'll see the vortex of air extends from the lower lip of the intake to the ground. intensity of this vortex varies directly with engine and early testing indicated it would not pick up ob-s from the ramp. An aircraft run at military power cornflakes and other light objects on the ramp failed ngest any. This testing did confirm, however, that object above the ground caught in the vortex would to be sucked down the intake. This may help explain some objects such as gear pins and communications s have been lost in this manner.

Before the left engine was shut down, the assistant crew chief dropped the main landing gear pin. The wind caught the streamer, dragging it toward the left engine, and before it could be retrieved, the pin was sucked into the left engine.

During a check for afterburner light with left engine at 100 percent, the ground crewman's communications cord was wrapped once around the main gear lateral beam and the remainder was lying on the ground. As the crewman was recording readings, the cord was ripped from his hand, disconnected from his headset, and ingested by the engine.

ere have been reports of communications cords ng on the ramp below the inlets of engines that were ng, but the most unusual incident involved a set of

eak! These chocks hung up before being ingested. Even were too close for comfort.

Fortunately they only made it as far as shown in ompanying photo and no damage was done. They cked up from the ramp as the aircraft was being lled in the arming area. The engine power setting

This area can be like one huge vacuum cleaner. Just one split second of inattention can spell FOD.

was near idle at the time.

There are many different sized fasteners securing panels on the F-111. These fasteners have been blamed for engine damage in 23 cases and implicated numerous other times. Problems start when the required fastener may not be readily available and "one that fits" is substituted. Now the "one that fits" may look okay, but if it is too long, it may damage the receptacle and eventually work out or, if too short, will not have proper thread engagement and work out. Torque values are specified for these fasteners to preclude receptacle damage and ensure security. Fasteners securing high use panels such as electronic equipment bays may wear out precluding proper torquing. Any of these conditions can and have led to fasteners coming out in-flight and damaging an engine.

Help is on the way to end some of the confusion associated with using the proper fastener in the form of TO IF-111A-2-2-1-1. It is at the printer and should be distributed early this year. It will provide a one-source easy reference for flight line personnel to determine correct fastener size and torque value. The pocket sized format is designed for ready reference on the flight line. (See page 4.)

A problem with hydrogen embrittlement of fasteners, causing them to break in service, should be corrected by this time. Suspect fasteners were purged from the supply system and replaced with hardware manufactured by a different process. Only one manufacturer was involved and his current product has an "O" or "OO" stamped on the head to identify the improved production fastener. The kicker is that one batch of fasteners recently arrived at an F-111 unit containing items that were supposedly removed from the inventory. Have you checked the fasteners you're using lately?

SPIKE CHIMNEY Spike "Chimneys" provide the third path foreign objects have for reaching the engine. They enter through boundary layer air exit louvers on top the aircraft and work their way into the spike area. Objects are difficult to see in this area and may remain in the spike for years before falling into the intake. They may work loose through normal airframe vibration or by spike

Section 1 T.O. 1F-111A-2-2-1-1

C3001 SERIES FASTENERS

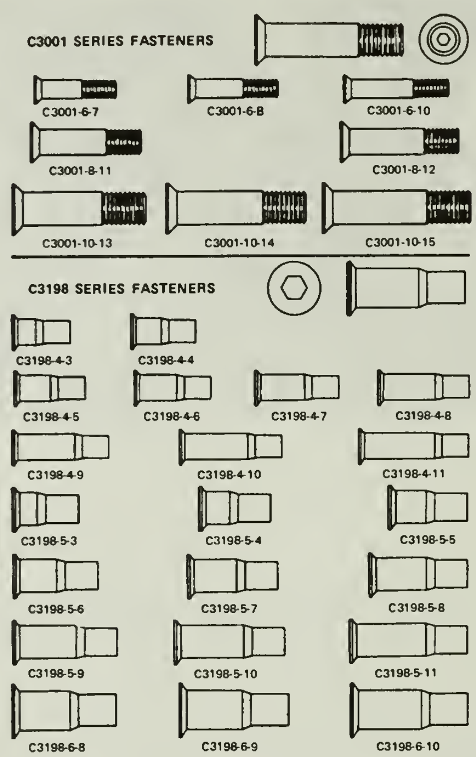
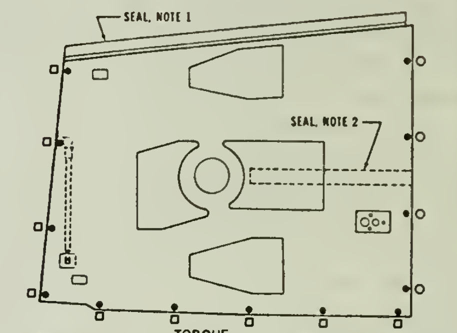


Figure 1-11. Fastener Identification Data (Sheet 12)

1-32

T.O. 1F-111A-2-2-1-1 Section II



FASTENERS	QTY	TORQUE IN-LBS	RECEPTACLES	QTY
⚠1 • C3198-5-5	13	40-50	□ C393-5-9-0	9
⚠2 • C3198-5-6	13	40-50	○ C393-5-10-10	4

EFFECTIVITY:

⚠1 F-111A, F-111E, F-111F, AND FB-111A

⚠2 F-111D

LIMITATIONS

1. ONE BOLT MAY BE MISSING IN EACH ROW (FWD, AFT AND LOWER) PROVIDED NO ADJACENT BOLTS ARE MISSING.
2. NO LOOSE FASTENERS PERMITTED

NOTE:

1. SEAL ALONG HINGE LINE IS MADE FROM P501B-4H MATERIAL AND INSTALLED WITH RTV732 (DOW CORNING) or RTV1D2 (GENERAL ELECTRIC) POTTING COMPOUND IN VOIDS, AROUND FASTENERS, AND BETWEEN SEAL AND STRUCTURE/DOOR
2. 1285026-11 SEALS MADE FROM P521B-1 ARE INSTALLED ON DOOR WITH EPON 9300 (SHELL CHEMICAL CO.) ADHESIVE BETWEEN MATING SURFACE AND DOOR.
3. 1285026-12 SEALS MADE FROM P501B-4H ARE INSTALLED WITH RTV732 (DOW CORNING) OR RTV 1D2 (GENERAL ELECTRIC) POTTING COMPOUND BETWEEN MATING SURFACE AND DOOR/STRUCTURE

1F-111-1288

Figure 2-2. 1101/1201 Forward Equipment Bay Forward Door

2-11

These two pages are from the new T.O. IF-111A-2-2-1-1. The T.O. contains illustrations of every panel on the F/FB-111 and the correct fasteners, receptacles, and torque values to secure each panel. In this example, the forward electronics bay is held closed by 13 fasteners. The F-111D uses size 5-6 whereas all other models use size 5-5 and the four receptacles used along the forward edge differ from the remainder. Torque va all cases is 40-50 inch pounds. The T.O. als tains a full size shadow diagram of all fast used on the aircraft. These can be used to the correct size of fasteners in use. Figur shows the actual size of the C 3198 5-5 ar hardware used to secure the forward electr bay.

operation at supersonic speed. Objects entering via this route are hard to trace, but this example is typical:

> **Engine most probably ingested a fastener during pilot engine ground run prior to takeoff. A 4-inch scratch below the left engine spike indicated the object came from behind spike during ground spike check as aircraft did not reach spike speed during FCF. Additionally, marks matching above fastener were found on spike upon removal from aircraft.**

Spike X-rays help detect objects in this area but there are sealed compartments in the spike that contain foreign objects which will never be released. Confusion results in trying to identify objects that are free to be released. The answer is to prevent the initial entry of foreign objects through the use of louver covers any time personnel are on top of the aircraft.

Everyone associated with the F/FB111 aircraft should be aware of the three entry paths foreign objects reach the engines. This requires a continuing ed program on the importance of using correct fas louver covers when working on top of the aircraft, control of communication cords connected in the well, and finally, the hazards associated with th velocity air flow through the auxiliary air inlets torical data show it will only be a matter of time another headset is ingested. Who will lose it? Ho not you after having read this.

Editor's Note: A great deal of effort has gone reducing the F/FB-111 engine FOD poten Put your unit's program on paper and mail the author at AFISC/SEFF, Norton AFB, 92409. He will compile the responses for distr tion to all units operating and maintaining aircraft. ★

FITNESS QUIZ

Colonel Richard B. Pilmer, USAF, BSC
Chief, Physiological Training
USAF Regional Hospital Shaw
Shaw AFB, SC

What shape are you in? Helleva ( ), Good ( ), Absolutely Fantastic ( )? In case you don't know for sure, take five and find out. This little test will give you a pretty good idea, but it will not substitute for the advice of your flight surgeon.

Aircrew Five Minute FIRST AID and SURVIVAL SELF-test.

1. What is the normal respiratory rate for a person at rest?
2. What is the average heart rate for humans while seated?
3. About how long can individuals in good condition (without hyperventilating) hold their breath?
4. In CPR (Cardio-Pulmonary-Resuscitation) what is the ratio of delivered lung inflations to chest compressions?
5. If your car or aircraft broke down in an unpopulated region, how would you attract attention?
6. When exposed to a loud noise, how would you protect your ears without plugs or muffs?
7. If a person were told by a flight surgeon that excessive breathing was causing hyperventilation, what should he or she do?
8. If normal muscular contraction depends on a chemical transmitter substance, acetylcholine, and nerve gas causes a net overabundance of this substance in the body, what are the symptoms of nerve gas inhalation?
9. How could you illustrate that the eyes are necessary for normal orientation of the body in certain body positions?
10. Which vitamin has a proved minimum established daily dose for maintenance of optimum health?

EXTRA CREDIT:

Which two questions are most related to a method of determining your physical condition without a treadmill or without jogging for a mile and one-half? For correct answers, turn to page 26. ★

HELICOPTER lightning strikes

assumption that lightning
rds for fixed wing aircraft are
ame as those for rotary wing
aft is not entirely correct. Due
mewhat different operating
ronments and complexity of
ms, the hazard of a lightning
e to a helicopter can be much
ter.

Phillip D. Pettit
Army Aviation Center

ightning strikes to helicopters are increasing each year because of the large numbers of heli- ers in use and the number of s flown. Fortunately, the dam- s usually minor and has not re- d in a major maintenance prob- Occasionally, though, damage een severe and at least one con- d catastrophic helicopter light- strike has been recorded by the F. The potential for damage is being increased with new non- cting skin materials and rotor s such as fiberglass and special rials to reduce radar and in- signatures.

TRUCTIVE ENTIAL

htning ranges from 1,000 feet miles in length, with the most on type about 1 mile long. The content of a typical stroke is 400 million horsepower (hp). ing striking the earth each day tes 3,456 trillion hp—enough to a height of 100 feet a weight to 200,000 aircraft carriers. eturn stroke, the visible part htning, travels at 100,000 per second and has a temper- of 50,000°F., five times hotter e sun's surface.

Contrary to appearances, lightning is not a simple flash, but a complex series of events. The tremendous potential (10-100 million volts) that builds up is strong enough to ionize the air and develop into a chain reaction. A zigzagging ionized path called the stepped leader is formed. The leader zigs or zags about 50 meters in each step, pausing about 50 millionths of a second as it forks at each step seeking areas of potential difference.

With each step the cloud charge is effectively lowered, increasing the strength of the electric field between the leader and the ground. This greatly intensified field causes streamers of positive ions to spring from trees or other projections and travel upwards to meet the downcoming leader. As they make contact, the leader is neutralized and the ground charge flows back to the cloud, creating a current as high as 200 thousand amperes. This current is called the return stroke and is responsible for the bright flash and noise associated with lightning.

WHY DOES LIGHTNING STRIKE AIRCRAFT?

This is a question which to date has not been answered to everyone's complete satisfaction. The most prevalent authoritative opinion is that aircraft are struck only when they happen to pass near the natural stroke path of lightning.

This concept, illustrated by figure 1, theorizes that, as an aircraft flies near a charge center or advancing leader, the electrical field induced around the aircraft may be intense enough for streamers to form and travel out toward the leader or charge center. As the aircraft field increases in intensity, the leader advances toward the aircraft and joins a streamer emanating from the aircraft extremity. Since the aircraft will not absorb the charge, it becomes the next step and streamers emanate

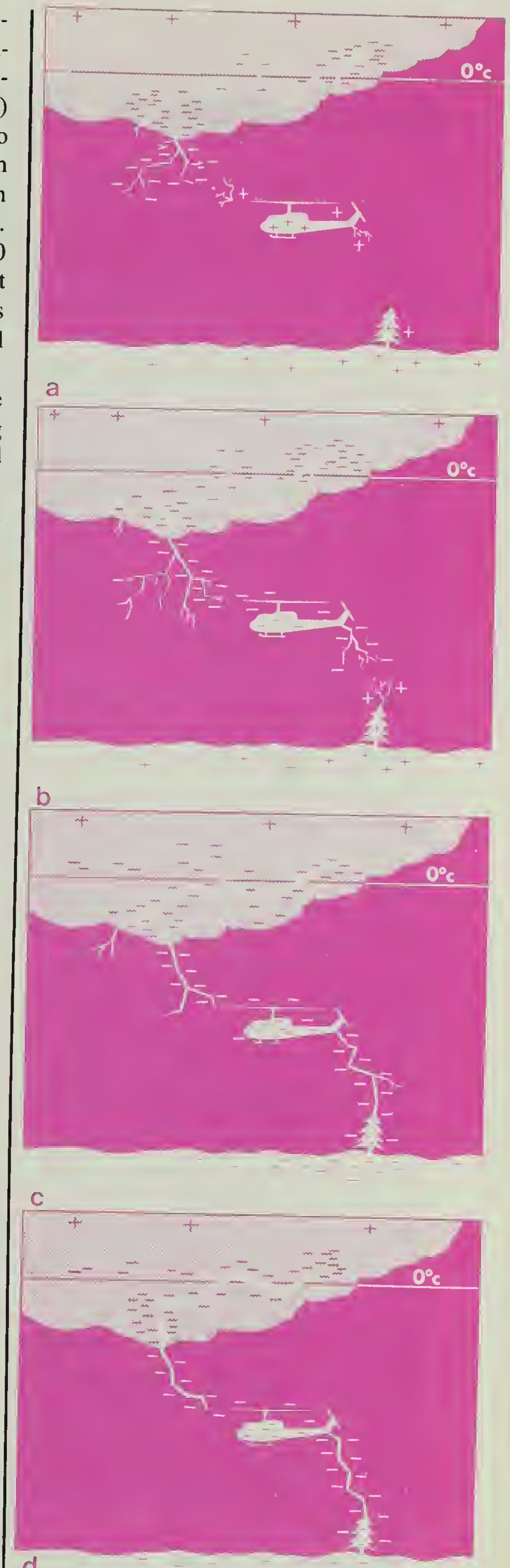


FIGURE 1.—Strike Sequence

Helicopter lightning strikes continued

from other extremities as the leader progresses to the next step. As the stroke joins the ground streamers, the aircraft becomes a link in the conductive path until the charge dissipates.

Statistics on lightning strikes seem to show that altitude plays a minor role in determining the likelihood of being struck. Recent reports show lightning strikes to fixed wing aircrafts as high as 37,000 feet with most occurring below 20,000 feet. Reports on rotary wing aircraft show strikes from a height of 9,000 feet to as low as 100 feet, with the majority occurring below 6,000 feet.

Although height and temperature are naturally correlated, studies of lightning frequency as a function of temperature and height show a strong tendency for strikes to occur in the 0°C zone. The preponderance of strikes near the freezing level must be related to the fact that the negative charge center is also found near this temperature and altitude. Another important reason for the greatest number of strokes near the freezing level is that the negative charge is not located at a single point, but is spread out with varying densities over a large volume. Indications are that lightning strokes do not follow a simple straight line vertical path from the negative region to ground or between the negative and positive areas. Instead, the discharge travels more-or-less horizontally through much of the negatively charged region before turning up or down. Thus, an aircraft flying near the freezing level would be more likely to intercept a stroke than would an aircraft operating well above or below the 0° C isotherm.

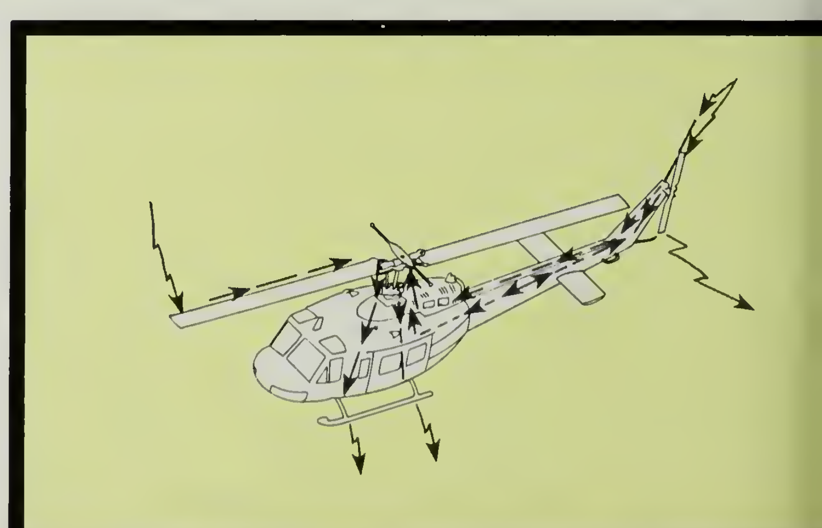
Helicopter operations conducted at lower altitudes and below the freezing level are endangered only by cloud-to-ground strokes. The relative frequency of cloud-to-ground strokes and chances of a helicopter strike depend upon the severity of the storm and its height above the ground. Even with increased IFR operations by helicopters, there has been no significant increase in lightning strikes while in clouds. All of the Army helicopters hit by lightning while in flight were operating at low altitudes, below the cloud level, and in the vicinity of developing thunderstorms. Data available from other services indicate similar experiences with a few exceptions.

EFFECT ON AIRCRAFT

Although the effects of a helicopter lightning strike can vary, in most cases the damage will be minor. No injuries to occupants of helicopters struck in the air have been recorded. In most instances, crew members reported a bright flash accompanied by a dull bang, with no adverse control problems or major electrical malfunctions. The greatest danger is major damage inflicted and associated with minor-appearin[g] ble damage to structural memb[e]

The danger of a fuel tank exp[l] is remote even though the JP-4 to-air explosive mixture is i[n] region of greatest lightning frequency. The primary hazar[d] direct puncture of the fuel cell but this is not likely since fuel are enclosed and protected b[y] metal fuselage. Hot spots devel[op] on the fuel cell walls from the c[urrent] flow would be extremely rare.

The usual approach in anal[yzing] problems of lightning strikes is termine the points of an aircraft are most likely to be struck. C[ener]ally speaking, these points on a copter are the tip of the main and the tail rotor pylon with a casional ground strike throug[h] landing gear. Figure 2 shows entry points and exit paths. A t[ypical] main rotor strike originates wi[th] attachment at the tip of the main blade, then travels through the rotor blade to the rotor head the charge divides. Part of the c[urrent] arcs over to the pitch change



wn control linkages and supports the airframe. The charge exits ough the landing gear to the ground through the tail boom, exiting the l skid. The other part of the charge vels down the mast into the trans-ssion, through transmission mounts the airframe, and exits through landing gear to the ground.

Further analyses indicate that kes in the tail boom pylon area in at the tip of the tail rotor or p antenna and pass through the rotor, tail rotor gearboxes, and ng the drive shaft into the trans-sion case. The charge travels up mast to the main rotor, back down ages, through the transmission to the airframe, and exits the s to the ground.

ightning strike evaluations of copters indicate that the degree of age depends on the magnitude of charge and point of contact. The owing general observations can nade based upon the findings from rmy helicopter ground/air strikes available data from other serv-

Lightning strike characteristics ifferent from other forms of dam-since arcing erosion and pitting asily defined from physical goug-denting, and sand erosion norm-encountered. Also, the damage d by air strikes and the dam-caused by ground strikes have ame characteristics in relation verity and cannot usually be dif-iated.

Main rotor blade evaluations ate that even though there is arcing and localized skin separa-catastrophic failure is remote. damage could possibly be more than observed due to anneal-f the material surrounding the ged areas. Most skin damage ten pitting and skin separation is confined to the trailing edge near the blade tip. Skin separation near the blade tips may result in a deformity that would produce vibrations and possibly control problems if prolonged.

• Tail rotor assemblies that are initiating points of strikes sustain arcing and skin damage very similar to main rotors. Arcing damage frequently penetrates the leading edge but does not usually extend into the core of the blade.

• Lightning strikes in the vicinity of whip antennas on either the top or bottom of helicopters usually result in severe damage to the antenna sections. Antennas subjected to a strike will usually shatter, but in most cases the associated avionics equipment protected by lightning arrestors continues to function with no damaging effect.

• Bearings, bearing sleeves and races, rod ends, bolts, yokes, and parts with any type of spark gap that are in the path of the charge generally receive arc burns and pitting. These parts, when checked, usually meet only slight resistance and give no indication of seizure. Arc burns and pitting should be cause for rejection since this would constitute abnormal wear and possibly lower fatigue life due to annealing.

• A high degree of residual magnetism will be prevalent throughout the airframe and component parts. Ferrous particles attracted to bearing cages or races may cause abnormal wear and early failure. Most components would be unaffected after normal degaussing procedures.

• Areas of major hidden damage are usually associated with minor-appearing visible or external damage. In most cases, no hidden damage will be found without visible damage of some kind.

SUMMARY

Lightning strikes to helicopters are usually cloud-to-ground strikes occurring at low altitudes. Because of the greater hazards of strikes at temperatures near 0° C, efforts should be made to avoid operating in the vicinity of heavy thunderstorm cells when these conditions exist. Careful planning and study of weather reports should help in circumnavigating these areas and avoiding other problems associated with thunderstorm activity.

When occasional lightning strikes do occur, usually there is little or no major structural damage or extensive arcing burns and pitting. The possibility of a catastrophic failure when main or tail rotors are struck is minimized by the design and strength of the blades. Structural integrity and control will normally not be insurmountable even though there may be partial skin separation of damaged areas and burns to the blade surfaces. Rotating controls and bearings, although subjected to pitting and burns, usually continue to perform as designed and as a rule have not presented any problem during air strikes.

The fact that lightning strike damage can be much more severe than visually observed is cause for immediate action. It is conceivable that lightning strike hidden damage could be so severe that a critical component fatigue life might be reduced to a few hours or even a few minutes. Should a strike occur or be suspected, the precautions outlined in the aircraft operator's manual and maintenance inspection procedures should be followed. Any helicopter subjected to a lightning strike must be given a close visual inspection and analysis to determine airworthiness before it is retured to flyable status. — Adapted from Oct 78 *US Army Aviation Digest.* ★

THERE IS A WAY

Annually the Air Force recognizes a given number of individuals, units and commands for outstanding performance in safety. However, competition is keen and not all win major awards. To recognize all of those, AEROSPACE SAFETY is featuring one or more in each edition. In this way we can all share in recognizing their fine performance and, perhaps, learn some valuable lessons.

Nominated for the Koren Kolligian, Jr., Trophy

Major Paul H. Froeschner

Major Froeschner, 4007th Combat Crew Training Squadron, demonstrated extraordinary airmanship while recovering an FB-111A on 17 October 1977. At night, while descending into low level at 425 KIAS, Major Froeschner's aircraft entered the clouds at 14,000 feet where all outside references were lost. Descending at 4,000 feet per minute, the radar altimeter locked on at 5,000 feet above the ground (AGL). Seconds later, Major Froeschner saw a bright flash on the leading edge of the windscreen and sparks filled his entire field of view. Simultaneously, he heard a loud "bang," the aircraft shuttered violently and began an abrupt, rapid roll to the right. All cockpit lighting was momentarily lost, and the stall warning horn activated. Feeling he was losing control of the aircraft, Major Froeschner applied maximum afterburner on both engines and backstick pressure to arrest the aircraft's descent and initiated a climb. As his airspeed decreased through 150 knots, he began to lower the nose of the aircraft to avert a full stall condition. His auxiliary flight airspeed indicator read 530 knots and the auxiliary attitude indicated a dive. He pulled the aircraft back into a nose high attitude and continued to fight the uncommanded rolling moment. With the rolling moment, continual stall warning indication and conflicting attitude and airspeed indications he informed Air Traffic Control (ATC) that he was considering ejection. Shortly thereafter, by using the auxiliary attitude indicator and cross checking it with the turn and slip indicator, he was able to establish a wing level climbing attitude. He noticed that the radar altimeter had broken lock indicating the aircraft was above 5,000 feet AGL and began to think the aircraft was recoverable. As he climbed through 15,000 feet, he broke out of the clouds and regained a visual horizon. Visual inspection by a KC-135 revealed no major damage. A controllabili check revealed that, when he turned off the roll da the abrupt rolling moment subsided to a point wher approach and landing could safely be accomplished With gyro-out headings from ATC, he descended through the clouds and broke out at 3,000 feet rega outside references. He then executed a gyro-out G an uneventful landing. Postflight analysis revealed damage caused by the lightning strike. Major Froeschner's performance in averting an aircraft ac and possible loss of life demonstrated his competer and professionalism.

Nominated for the Chief of Staff Individual Safety Award

Mr. Richard J. Scott

Mr. Scott has distinguished himself through outstanding performance as the Wing Ground/ Explosives Safety Manager at Williams AFB, AZ. dynamic leadership and ingenuity in developing an implementing outstanding safety policies, programs procedures are worthy of special recognition. His w in meeting Occupational Safety and Health Act (OS requirements and vehicle accident prevention has b particularly noteworthy.

Mr. Gordon N. Reese

Mr. Reese demonstrated outstanding knowledge, managerial skills and initiative in establishing a hig effective accident prevention program for the Strate Communications Area (SACCA). The SACCA cons of 27 units at 27 separate bases throughout the Unit States. Through his dynamic leadership 12 of his 27 units received National Safety Council Awards for accident reductions. ★

STATIC DISPLAYS and air shows

Major Roger L. Jacks • Directorate of Aerospace Safety

ecently read an article in *Avi- tion Week* by A.W. Bedford alled "Demonstration Flights ver Message." It discussed aring for and participating in hows and got me to thinking y experiences in attending air s and static displays. I re- bered the fun, the challenges the pitfalls a crew can experi- .

shows and static displays a chance to show the public the Air Force is all about, put rcraft through its paces, show pride in your aerospace ma- , and let your ego bask in the tion it receives from the spec- . Air shows are not only fun, necessary function of the rce. Displays develop public confidence, and pride in our y services. As crew mem- we owe it to ourselves, the rce and the American pub- effectively plan and profes- ly perform our roles in an Air display. Although it looks n easy task, it may be more ed than you think.

call my first experience at- g a static display at another The day before the display oroughly planned the mis- We were confident we had hing taken care of: Crew nation, the route, fuel re- ents, airfield layouts, AGE ements, ATC coordination, and even an extra set of gear pins.

The next day, our mission had been uneventful as we approached the base which was to host the static display. We were a few miles out of final when a call came over the radio: "Demon 22, this is the tower. We have a lot of folks down here that would like to see your aircraft perform. Could you do a few maneuvers before you land?" In the cockpit, total surprise prevailed. This was to be a static display. No one had said anything about flight demonstrations. The pilot thought for a minute and then said, "Sure, any restrictions I should be aware of?" The tower answered back, "The only restriction is your ability!!"

Well, we had total mayhem in the cockpit. The pilot was trying desperately to get the aircraft cleaned up for a high speed pass and was thinking about doing some type of impressive pull up. The rest of the crew were busy monitoring the aircraft and wondering what was going to take place. Everyone was extremely anxious to find out if the controller's statement had gotten to the pilot. There was no time for crew coordination now; the runway was in sight and the show was ready to begin. Uncertainty was in everyone's mind. What maneuvers are we going to do? Will discipline and professionalism win out over ego challenges and dares?

Well, the story has a happy ending. Our aircraft commander put on a good demonstration without jeopardizing his professional standards or putting his crew or aircraft in an unsafe situation. Still, the fact remains we had allowed ourselves to be put into a precarious situation, performing demanding flight maneuvers without prior planning and coordination.

The professionals such as Bill Bedford say that's a good way to end up 6 ft or 60 ft under ground. In *Aviation Week* he relates an incident that just about closed the curtains on his career. In the late 50's he was flying the two seat Hunter for Hawker Aircraft Ltd. He had been demonstrating the aircraft at the Farnborough Air Show doing a spectacular 13 turn smoking spin from 18,000 ft to 6,000 ft, where he would initiate his recovery. Shortly after the close of the show, he was directed to fly the plane to Switzerland and demonstrate it to the Service Technique Militaire. As he approached the field, the controlling authorities asked him to put on a demonstration. Although it was unplanned he agreed, and proceeded to put his aircraft into a steep dive and let loose with a series of low altitude aerobatics. As his performance neared its conclusion, he decided to do the smoking spin maneuver.

As crew members, we owe it to ourselves, the Air Force and th American public, to effectively and professionally perform our roles in an Air Force display. Although it looks like an easy it may be more involved than y think.

He entered the spin at the normal 18,000 feet and everything was going smoothly as he spun his way down to his 6,000 ft recovery altitude.

As the target altitude approached, Bedford began to ease the aircraft out of the spin; everything was going right—until he looked outside the cockpit and saw the ground unusually close. As he puts it, "A brief feeling of professional pride was suddenly shattered . . . adrenalin flooded the cockpit, the pilot became less efficient. I had arrived at coffin corner. Pull too hard and I've had it; don't pull hard enough and I've had it, and I've probably had it anyway," What had gone wrong? In his rush to honor the controlling authorities request he had forgotten two things: To reset his altimeter and to remember the differences in field elevations at Farnborough and the Switzerland field.

This story, too, has a happy ending: Mr. Bedford made it with a few feet to spare. If it can happen to one of the best, it can certainly happen to one of us. Bedford says it best: "To avoid the pitfalls and prolong active life, an important, fairly obvious requirement is to stick with concentrated determination to the guidelines and to one's own strict personal professional creed. . . .

Here is a collection of other ideas to keep in mind when planning for a static display or air show.

- Plan basic demonstration patterns well ahead. (Have a plan to handle arrival and depa requests in case you're aske perform some maneuvers u pectedly.)
- Study the display area, k and understand all the rules o air show.

Ensure that the fuel allowa is sufficient to cope with the expected.

- Recognize the importa of a disciplined demonstra Avoid at all costs getting su into trying impromptu maneu to outdo someone or to fulfill w less challenges.
- Prepare mentally and p ically for all manner of distract at critical periods in the dem stration, i.e., ambiguous radio m sages, systems going off line,

a good USAF crew does , but even more critical demanding flight regimes). alize the killers in de- g flight maneuvers are lack centration, overconfidence k of current practice.

alth and fitness are al- mportant. Good physical n with a healthy mind that's dened down with stress, l problems or fatigue is

ce the crew planning is it down with your com- and tell him your plan. er all aspects of the static or air show and try to an- the unexpected, the prob- as. Once you've finalized me plan, try and stick to it.

Have fun, but approach demonstration flying with your utmost professionalism. The experts sum it up best. Pat Henry, Chief Experimental Test Pilot for the McDonnell Aircraft Company and one of the F-15 demonstration pilots states, "In my opinion there are three basic tenets of demonstration flying—discipline, knowledge, and maturity. Discipline is the primary motivation during the demonstration. It is the force that compels you to enter each maneuver from well-known and practiced initial conditions. Intimate knowledge of aircraft capabilities and maturity complement the discipline factor and ensure a reasonable compromise between overconservatism and edge of the envelope showmanship."

Neil Anderson, Chief Test Pilot of General Dynamics and F-16 demonstration pilot says, "We approach demonstration flying with the identical and deliberate preparation that precedes the most difficult test phase. This includes highest management approval, designated pilots, contingency/ weather conditions, safety aspects and, most important, the training prerequisites in the demonstration aircraft. ★

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The Care and Feeding of

ATTACHED CREW MEMBERS

or David V. Froehlich
ectorate of Aerospace Safety

A heretofore endangered species, this often misunderstood group has settled colonies in almost every ng organization around. They e in all sizes, shapes, ages and rs, and are called a variety of es from the more formal ached crew member'' to the ble ''staff weenie'' (or worse). e individuals can be recognized current weapons system ifier of ''desk, 1 each, gov't , usually grey, etc.'' Take pity ese poor creatures, all of you me fliers, for some day you also join the ranks of the some- aviators.

re seriously, with the post- drawdown and cuts in flying nd slots, there seemed to be rease in the numbers of flying occupying non-flying jobs. fall into a variety of Rippy codes but are flying mostly e: (1) their job requires a uing closeness with flying ions (i.e., safety, scheduling, r (2) the individuals haven't rtain ''gates'' requirements. en flying for about 12 years ve had several ''experts'' the entire system to me and gave up trying to understand fact is that most flying ations have anywhere from l'' to ''numerous'' (over 50) embers who may fly only three times per month. In ses they are still carrying e responsibility and must n the same proficiency as the no fly five or ten times as hus the reason for this

k from experience. I am one ''well-rounded USAF who suffer from terminal ent-itis.'' No complaints, I have been fortunate o check out in six different and hold a variety of interesting jobs. The bad part of the deal is a weakness that I will admit – I am not as proficient a pilot as I would like to be. I don't care what anyone says – the more you fly, the better you will be at it! Sure, there are related problems like complacency, overfamiliarity, distraction, etc., but basically you have to do it to stay good at it! With that in mind, I'd like to pass on some ideas from someone who has been ''attached'' in three different MAJCOMs and three different airplanes for the past 6 years.

THE PLAYERS

''The Attachee'' – usually in the grade of captain or major, but can be as senior as 0-6. The attachee has anywhere from a variety and depth of experience to no experience at all. They vary from lots of availability and desire to fly often to the phantom of the line.

''The Attachor'' – varies from a squadron whose manning is low due to a large number of attachees, to the squadron who has a very specialized mission or complex weapons system and only one or two ''visiting'' fliers.

PROS AND . . .

For the unit – The organization can benefit from the attached flier. Aside from the gain in manpower which hopefully (not always) benefits the squadron, attached fliers often bring with them a background which can enhance the experience level of a unit. This outisde and ''ancient'' perspective may be of great value to the flying unit which has today's common dosage of ''teenage low-time throttle benders.'' Seriously, some of us old folks have been places and seen ways of doing things that might help your operation.

For the flier – The obvious benefit for the attached individual is the opportunity to maintain some semblance of currency. Not only is this important for the hands-on part of aviating, but also for the myriad of rules, regs and paperwork we live with. For a flier to be completely away from the book aspect of operating airplanes for 4 to 5 years really requires a comeback.

CONS AND . . .

For the unit – Many flying units are first to grasp at the disadvantages of having ''to put up with staff pukes flying *our* airplanes.'' Without going on the soapbox about all in the same color uniform, etc., I will grant that, yes, there are some disadvantages. First, you may find glitches in your scheduling process. Availability – the word which conjures up different points of emphasis in the minds of attachees, bosses and schedulers! Yes, Virginia, you will probably have to put up with some cancels, lates and snafus because the attachees aren't under your thumb like your full-time folks. Second, it is a plain fact that some of your attachees may not be as proficient on the pole as you line jocks! Therefore, the managers and supervisors in the organization may have to match crews, schedules, crew positions and missions.

For the flier – The bad part for the crew member is the double job. They are expected to maintain knowledge and currency while still doing their primary job. Often the flier will get little-or-no support from his supervisors. Reactions vary from jealousy to outright harassment. Not always the case, granted, but I have seen it to be like pulling teeth to get time to fly. Shouldn't be that way!

ADVICE!

For the unit – Take an objective look at your program with regards to two areas: Training and Scheduling! Continuity of training for attached folk requires some extra thought and effort. Don't get the wrong idea 'cause the last thing they need is pencil whipping or abbreviated training. All I say is that they may require a little consideration when it comes to times, places and depth. Example – I've gone to systems refreshers that turned into "glossovers" for the full-time fliers when I would have liked to get down to it and really relearn and refresh the system in depth. That's an easy trap for full-timers to fall into because they deal with the info day-in and-day-out. Take an empathetic look at your training programs from the viewpoint of a person who can fly only 2-3 times a month.

Scheduling needs special attention too! Again, a little empathy is in order. Be willing to massage your schedule a little. If an extra mission arises, take the extra effort to call some attached folk. They probably need the practice! Be aware of the attachee's possible supervisor problem and work with them to maximize both your efforts.

Honest shot! Remember, above all, that you are responsible for your operation! If you feel you are expending the effort and you do have an attachee that isn't hacking the program either proficiency or availability-wise, do both of you a favor and tell him! Ignoring the problem won't make it go away unless it turns into a mishap statistic!

For the flier – The best advice is to KEEP UP! Granted, that's an oversimplification but a lot of attachees get lulled into a false sense of security. Realize that you need to force yourself to stay in the books more and work harder in the cockpit. Shoot the ILS and a VFR day instead of the visual or 360. Take good advantage of every training opportunity you get. Take extra simulators, trainers or whatever – you need 'em! Above all, be honest with yourself about your own knowledge and proficiency. You may have to adjust your own personal minimums upward if you go 29 days between flights. Don't let deadly pride back you into a corner.

For the supervisor – You are in a unique position. You have one-or-more folks working for you who are moonlighting as aviators. I say that because I have been an attachee since the last war and have been fortunate enough to have bosses that either supported or at least didn't hassle, part-time fliers. I have seen the boss who wore the other hat however. I've heard the statement "Flying isn't your job anymore, if you want to fly do it at night or on weekends." You gotta be . . . kidding me! Believe it or not, there are those around. Again, without getting on the "fly and fight" soapbox, let me advise – as a supervisor, yes, you have a duty to your mission! A portion of that mission is care of your people and an attached flyer needs a little extra care. Part of his (or her) trade is aviating, regardless of the current job title. Time needs to be made available for the pursuance of proficiency in that trade. Work with 'em, not against 'em!

Of course, the thrust of this article is favored toward the flying of aircraft by attached crew members. I am one, so it's very difficult for me to write a piece saying "help stamp out part-time fliers." I don't believe that would be a good plan anyway. I feel there is a valid place for attached crew members in any operation. The main point is that they can't be conside[red] the same as full-time fliers and th[ey] shouldn't consider themselves the same as full-time fliers. Either situation might, at best, be embarrassing and, at worst, dangerous. Recognize attachees fo[r] what they are – part-time aviators with advantages as well as possibl[e] limitations. Safe and sane aviating [is] the goal, regardless of the categor[y] of operators. ★

MESSAGE TRAFFIC

Winter and Spring bring all o[f] the traditional hazards associated with marginal weather. A recent HQ AFISC message cited the tragic result[s] of attempted VFR flight in deteriorating weather condition[s]. We had a close brush with this [in] 1977 when an OV-10 was forc[ed] into a 180 degree turn in rapid[ly] deteriorating weather condition[s] and hit a power line. Luckily th[e] only damage was to some aircraft sheetmetal and the pilo[t's] peace of mind. Others, howeve[r,] have not been so fortunate:

1968, KOREA: Flight of four F-4 D's was weather recalled t[o] home base. Lead sighted a sucker hole, attempted to lead the flight under the clouds, lost control, and crashed.

1969, CONUS: Following a l[ow] level an RF-4C crashed at the range entry point. Weather was 500 ft scattered, 1,500 ft broke[n,] visibility 3-to-5 miles in rain and snow.

1970, CONUS: An RF-4C aircraft crashed on a VFR low level route in known deteriorati[ng] weather.

1972, Spain: Two F-4D's we[re] returning to home base from th[e] range at low level. They impacted 200 ft apart, 2,300 ft [up] the side of a 2,400 foot mesa.

continued on pa[ge]

letters to REX

AR REX,

just finished reading an article in our local base er which praised our local transient alert person- for winning the coveted Rex Riley Transient Serv- Award. The article was a good one complete pictures, and passed on some well-deserved se for a hard-working group. My only complaint at the article left most people with the impression TA was the only agency involved.

vrite because I think you need to remind your ers again that safe, efficient service for tran- aircrews is a *team effort* involving numerous cies on base. The combined professional atti- s and performance of TA, billeting, base ops, portation, food services and AFCS personnel ir base were responsible for our selection to ve a Rex Riley certificate. We're all proud of it nope we keep it for a long time.

Concerned

Concerned,

uldn't have said it better! I might mention that al bases have had their graphics folks make up of a certificate with the Rex patch on it to be yed in billeting, TA, etc. Since we can only one actual certificate and recommend that it ng in base ops for crews to see, this type of an ement allows all agencies to share the honor. nly problem that crops up is removal. We have ed a few bases from the list (and plan to re- a few more) and want to retain the flexibility e folks off when their service warrants. This ause some shuffling among agencies con- l, but it will remain one of those necessary s if the situation arises. Thanks again!

REX,

s happy to hear the announcement that your n of base evaluation of transient services was nd well as reported in "TIG Brief." Over the many bases provided outstanding support to embers because they wanted to earn the Rex ansient Services Award.

rew members in Air Training Command have e problem you may be able to help us with. sion is to train pilots, and our student cross s are invaluable in that regard. Unfortunately, ases restrict our ability to perform that mission. The enroute supplement is filled with PPR's, OBO's, limited TA hours, one approach to a full stop and numerous other restrictions that severely limit the student pilot's exposure to strange fields and approaches. Since we must maximize our training on every mission these restrictions are limiting our ability to train pilots.

Hopefully, your evaluation of a base will include a review of the base's enroute supplement restrictions. Your assistance in reducing those restrictions to enhance our training will be a big help to the jocks in Air Training Command.

ATC IP

Dear ATC IP,

You're right! Also try some pre-coordination for regular training with times, places, standard arrivals, etc. Lots of places would be willing to help you out if you'd give 'em some advance info to work with so they can coordinate with TA, POL, transport and other interested agencies. Cooperation is the name of the game.

DEAR REX,

A couple of weeks ago some aviators filed a 175 for a formation flight. One aircraft was an F-4 and the other was a T-38. The F-4 was lead and the pilot called tower requesting clearance for "FLOP 01" a flight of two. Tower replied that clearance was not available. Several minutes went by when "FLOP 01" again requested clearance. Tower still had a negative reply but queried base ops. Base ops stated that they had no clearance request or flight plan for "FLOP 01." Many communications later "FLOP 01" and wingman launched. What happened was: When "FLOP 01" filed his flight plan he put both his call sign "FLOP 01" and wing's call sign "ZOOMY 04," in the call sign block. In the type aircraft block he listed both aircraft by type. In both instances the T-38 was listed first. Since the ARTCC computer will only accept one type aircraft and one call sign, the base ops guys indicated "ZOOMY 04"—2/T-38s. The tower had a clearance for "ZOOMY 04" flight but not for "FLOP 01" flight. Get the picture? Anyway Rex, the formation commander should have put lead call sign and type, i.e., FLOP 01, 2/F-4s, in the top blocks of the 175 and in remarks indicated: #2 aircraft is T-38 (ZOOMY 04). Please pass this note to all your readers.

Base Ops Type

Dear Ops Type,

An isolated example, but a good point. A lot of folks are somewhat complacent about the info they place on the top three lines of the 175. Aviators–it's a good time to dig into FLIP for a review of what the form really calls for. Might save you some time and JP. ★

Rex Riley on the road again! A reminder that "Yes, Virginia, our friend Colonel Rex Riley *did* retire from active service several years ago." However, we have had such excellent feedback on the award program that there would be much lost in the translation if we tried to re-name the program and re-educate the folks in the field. For that reason, we still refer to "Rex Riley" making evaluations and we will publish some "Dear Rex" letters. We feel this goes along with the intent of the program. Speaking of "intent," we'd like to pass on some philosophy.

We are approaching the evaluations with the feeling that:

1. A base already on the list is the most vulnerable! We will look extra hard to see if they measure up and deserve to retain the award.

2. A base not on the list will really have to dazzle us in order to be recommended for the Rex Riley award.

The above may sound somewhat hard-nosed and sanctimonious, but time and time again we see installations doing more with less. Money shortages, facilities reductions and personnel cutbacks don't qualify anyone for a "lone ranger" rating. The point is that lots of folks are providing super service despite those problems. The common answer to all the good guys is attitude! We are going to try not to reward mediocrity. Nuff said!

Information An area worthy of mention seems to be the relationship between TA folks and the aircraft 781. I don't pretend to know all of the intricacies of the business, but I can sure tell when someone has spent some time in my forms updating and checking. On the last evaluation trip we stopped several places that didn't bother to enter a thruflight let alone put in an entry for the fuel. It's that extra knowledge and time expended that may catch an overdue SOAP sample, inspection or T.O. check. Could be an area worth checking your own house for! The 781 is a safety tool for both crews and maintenance fol only if it's used properly.

An idea that dazzled me on my last trip v innovative and well-coordinated "RON" packe three-sheet packet contained a base map rep list of neat times and phone numbers and a "dep pre-brief" sheet! The last item seemed like a re to both crews and base folks alike. The disp handed me a packet and asked that I take a fe utes to fill it out before I left. It was a simple calling for some info which would smoothen parture the next day. Such items as # perso quested transport time, flight lunches—yes departure time, special equipment requests, c tion and alternates and flt level were on the From this questionnaire the base ops folks nated my entire departure including wheels, liminary weather info, and PAX services. Sur can be changes and glitches, but it's an exa some ingenuity, empathy and super attitudes base to save the crew member hassle and phone calls.

Retained awards

HOMESTEAD AFB, FL

Way down South, the airdrome is not exac crossroad, but it is still a good place to go. Go transport and billets for transients. Lots of little traffic in the area—keep eyeballs movin

PETERSON AFB, CO

Pete continues to be a good X-U.S. stoppin Transient folks, base ops and transport sys among the best. Quarters were super and all f close and handy. CAUTION—Some inbound review of high attitude performance factors, rising terrain and landing at a joint-use r

an airdrome may prevent embarrassment or in-
Weather changes faster than a speeding bullet
n't get caught.

E AFB, NC

other place with lots of traffic, a super-close
cted area and often changing weather. Folks
pe seem genuinely interested in providing good
ce.

ER AFB, DE

ution—wake turbulence from the heavies! Even
h a "Big-MAC" base, Dover takes good care of
tle drivers too. The service is a direct result of
ientious attitude from supervisors on down.
let up!

um!

en you visit 50+ USAF and ANG bases within
onths, you can't help forming mental com-
ns. This trip we visited two bases which were
the grade but just barely. Compared to many
eally top notch places we've visited, these two
"ho hum" for transient services. The kind of
hat doesn't give you any real bad deals but
sly doesn't expend a lot of extra effort either.
t reason, we aren't sending them a Rex cer-
Hopefully, we can get the list to eventually
the bases and individuals who are out there
y trying to create and maintain extra good

Other Hand . . .

so spent some time (too much in one case)
places which could use some cleaning up of
. To protect the guilty (and, reduce the num-
ate phone calls) we'll call them X, Y and Z.
e X—Base ops flight plan room a disaster!
falling apart and charts missing to name a
lems. Billeting usually good but some rooms
state of disrepair. TA lackadaisical. Other
. . . .
y Y—Transportation took 45 minutes and
-show. Could have died of old age waiting.
om not very conveniently arranged and had
set of charts available.
e Z—Arrival was a disaster! Approach,
d ground control obviously hadn't had a
ion in quite a while. It was downhill from
k 90 minutes to get gas and go. Granted
a few extra birds but still no cigar!
the common thread seems to be apathy.
tance of an attitude of "just doing enough
is obvious as you travel from base-to-base.
a bad deal, write REX! (AFISC/SEDAK,
Riley, Norton AFB, CA 92409.) ★

THE

REX RILEY

Transient Services Award

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
ENGLAND AFB	Alexandria, LA
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AK
PETERSON AFB	Colorado Springs, CO
RAMSTEIN AB	Germany
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
TORREJON AB	Spain
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
NORTON AFB	San Bernardino, CA
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
CARSWELL AFB	Ft. Worth, TX
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayeteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND
VANDENBERG AFB	Lompoc, CA
ANDREWS AFB	Camp Springs, MD
PLATTSBURGH AFB	Plattsburgh, NY
MACDILL AFB	Tampa, FL
COLUMBUS AFB	Columbus, MS
PATRICK AFB	Cocoa Beach, FL

THE MIDDLE EAS

Ronald P. Barrett
President: Saudi Aviation Maintenance Manufacturers Association

The captain tuned in LUXOR on 112.3 and the copilot confirmed that LXR was being received Loud & Clear.

The NAV called out "over station" and tuned to 124 mag outbound on R39. "Cairo control this is Cobra I 129.4."

"Cairo control this is Cobra I on 129.4. Do you read?

"MEA reporting LUXOR at 17:15Z, altitude 28 thousand, estimating R39A at 17:40Z. Cairo do you read?"

The sun was dipping now below the hot desert ridges to the west. Out the right side could be seen the black snake image of the Nile extending into the distance. The cockpit crew was changing their radio communications and still trying to reach Cairo. The ETA to R39A was coming up in 2 minutes and not one word from ATC, anywhere! Out over the Red Sea now and R39B to report next.

"Go, Jeddah," the AC commanded in all confidence.

"Jeddah, Jeddah, this is Cobra I reporting at 28 thousand. Do you read?"

Static and electronic chirps was all the crew could hear when the red fire pull "T" handle suddenly turned brilliantly on, and the number 2 nacelle overheat came on!

"It's number 2, condition lever FEATHER," the AC commanded. He turned and could see smoke pouring from the number 2 nacelle. "Loadmaster to AC, there are visible flames this side of number 2 engine."

"FIRE HANDLE pulled"; the fire bottles were discharged, bleed air isolated and yet the overheat condition persisted.

The Cairo stop and images of the open number 2 cowling flashed through the flight engineer's mind. There was some fuel leakage at the fire wall zone, but it did not appear as anything significant; besides they had checked that engine over thoroughly. No matter, it was fully aflame now!

The emergency commands continued: "Generator Switch" – "OFF." "Fuel Boost Pump Switch" – "OFF."

The NAV had dropped into the 130's crew door area which was now aglow with the light given off by the torching turbo prop.

"It's burning worse than ever!" the NAV shouted into the cockpit. "Emergency descent. Nearest land 090° – 090°."

"Call JED, we're declaring an emergency." "AC, Loadmaster. We're filling up with smoke in here – going on smoke mask."

"How bad?" No answer. The Loadmaster was fighting to chute up the fourteen Army types in back. The aircraft began to shudder and the crew bags that had been stacked up on the top bunk tumbled onto the navigator's table. Smoke now was billowing into the cockpit.

"Jeddah, Jeddah, this is Cobra I on 121.5. Do you read? Do you read? Descending through 20,000."

BAM! The old 130 lurched to the left as the crew fought to maintain control and not to be overcome by the dense, acrid smoke. The yoke snapped over and the Herc started into a roll.

The AC fought the controls, finally rolled upright and prepared for a water landing. . . . Doors open, sea rushing up to the aircraft. Rafts out!

The passengers were the fi
go, the non-crew members in
random order were shoved be
the operating flight crew and
for two injured during the
emergency egress, all hit the
alive and as well as could be
expected. The aircraft tumble
the sea not far from the men
bobbing in the water. The fla
wreckage lit up the scene lik
morning sun. The calmness o
Red Sea allowed for a rather
but lengthy water gathering.
now taken 3 hours to get mo
survivors into the lone 20 ma

Of the twenty on board, tw
could not be found at sea an
the 18 men in the 20 man ra
injured badly, with all surviv
near shock. The crusty ol' co
appeared to have a broken b
the AC had dislocated his sh
and was cut deeply on the c
The water was warm, with a
10 knot wind blowing from
Northwest. The nav, as if by
looked at the dark, starry sk
tried to estimate the directio
drift of the raft. Impossible,
thought, no fixed references
copilot was now into the em
kit. "Where and the the hel
search people?" the loadma
asked. "Don't know," mur
the AC. Pssssssssss.

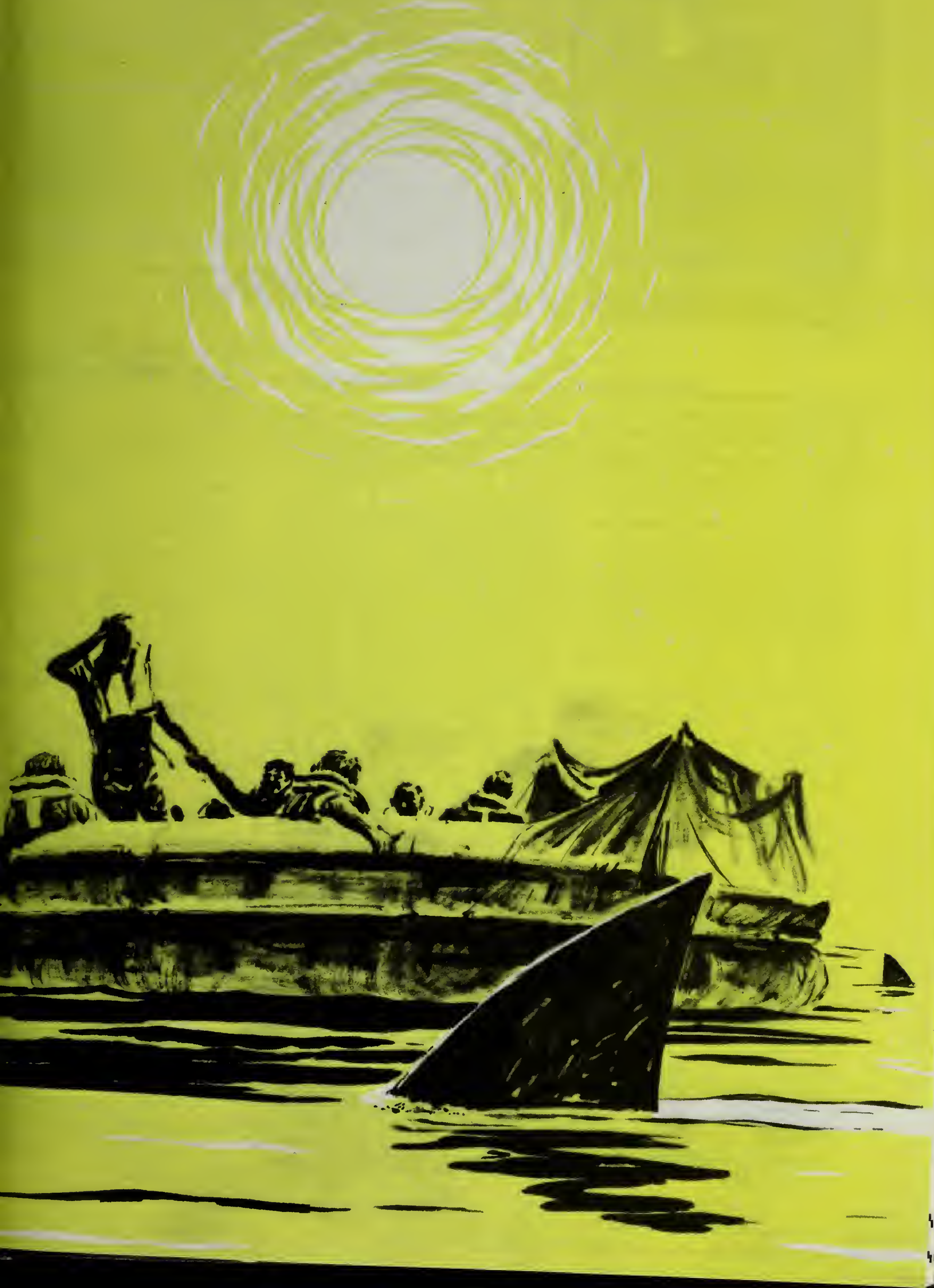
"OH, NO!" shouted one
Army types, "NO! NO! NO

The lower chamber of the
started to soften. The alread
jammed up bodies began to
into the center of the raft.

"Get the pump." At that
inflation of the raft was atte

It was a truly sad and we
group that found out that ra
very sensitive flotation devi

light Safety and Survival



Capsize! If this were to happen at sea rather than in shallow water the results could be disastrous.

In a simulation exercise the participants properly carry the raft to shore over the razorlike coral that could shred the fabric.

Pump as one might, a pin hole leak can lose more than a healthy man can pump! Raft pumps are poor pumps. More than that, who in the darkness was going to attempt tearing a hole in the raft chamber so that one of those archaic, ungainly raft repair patches could be used. An even more frightening event was when the raft sea anchor became fouled during the night on a coral outcropping and the nylon line "rubbed" the chamber raw making an entire 3-square-inch area pervious. And to make all matters worse the entangled sea anchor was cut free, and the surf passing over the coral shelf immediately capsized the raft.

The aircraft commander and colonel were drowned in the capsize because the raft canopy was up and they had become trapped inside. Most of the remaining 16 survivors now had cut feet, as they had taken their shoes off in the raft and were not anticipating hitting their feet on coral outcroppings. The canopy was of questionable use anyway, as no one could hear when seated under it due to the wind whipping it up and down. They could never have heard a search aircraft at any distance. Most of the items in the survival kit were spilled into the sea. Only what was tied to the raft remained. The sharks circled in deadly silence.

The young flight mechanic had often thought in his quiet moments while riding endless hours in the back: "What would he do in a situation like this?" He had remembered much from his survival training and added even more. He had swallowed his pride at 21 and had taken a full Red Cross Life Saving Course. He had been a poor swimmer up to then. He kept his LPU on in the raft, had tied his shoes to the side straps and kept a keen eye on the heaving line on the raft. It was he who had held onto the line, thus keeping the raft from flying completely away, and he had even saved his battery powered light. Now with light on, bobbing in the water, and towing himself to the raft he shouted to gather up the remaining survivors.

The raft had no light on it, so it was all but impossible to locate in the darkness. A pair of pants was tied onto the heaving line as a sea anchor. The canopy was "held about" as a round blanket, not to be put up again. By listening to the changing sea sounds and knowing that the swells were changing frequently the young E-3 knew they were traveling into a surf condition once again. If all conditions were right, the night sea/land bree
might carry the raft to shore
indeed this was happening.

Twilight now. Ten hours i
water, two lost, the sixteen
survivors, now exhausted, pr
for reef crossing. They could
shore line. "I can see bottom
of them shouted.

"Watch— don't get the an
caught."

"Pull it up."

"You do and we'll capsiz
again."

"NO!", shouted one of th
passengers.

"Play the anchor in and o
NAV you watch out the fron
we'll watch back here. The
you, half on the right side a
on left side— get ready and
to keep us on an even keel.
let us turn!"

Their game plan was a go
Five frightful minutes later t
successfully crossed the chu
reef. Terrified and weary, th
in shallow water now, when
Pssst! Gone was the last of

They had not realized tha
into hip deep water they sho
gotten out of the raft and ca
to shore. A small coral outc
had sliced it like a razor!

The sun was up now, the

e the raft can still provide valuable against the brutal 120° heat and sun.

l, re-inflated and canopy . Calm and peaceful for the t.

and/sea breeze reversed itself h a great "whomp," the raft on vertical edge now, rolling ke a great yellow doughnut!" austed survivors learned that ven on land, had to be d! The canopy poles had naged the raft and the s were very difficult to Bandaids were employed to e small remaining holes.

n climbed into the sky and ortable sea breeze turned ven-like jet current of 120° e stone white sands of the ach, where the surface ire reached 135° F.

ated, and having survived e men now had to face rivation. The flight hought back to the Cairo now no one wanted to take quire extra bottled water. no safe ground water in ey were in. On top of all World Health Organization this area is endemic to Disease, cholera and osses of body fluids, as arrhea, under these could be fatal.

day duty of all was now to conserve their precious body fluids and to stay in their "raft desert tent." The raft was fairly comfortable, providing shade, wind blast and dehydration protection, and kept the survivors off of the salty sands. A man under scorching desert conditions, doing moderate work can sweat a gallon of fluid away in one hour. If this were to happen he would surely go into heat exhaustion, delirium and die. If he were to survive, brain damage would be a likely side effect.

The raft was inflated, the canopy rolled up, with side walls open to allow the breeze through. All now settled down, drowsy in the 120° F heat, immobile, conserving body fluids.

"Sadique! SADIQUE!", called the dark brown man in a white flowing gown. (Friend, Friend) "INTA Quwais?", the stranger said. (Are you good?)

Some of the group, having studied Arabic, snapped up and entered into a lively conversation with the local Bedouin. They knew the rule of the local tribes was to help strangers and quickly informed the Bedouin that they were indeed "Sadique" and needed "MOYA" (water). At that the phantom stranger called out in a loud voice "Ta'all, Ta'all" (Come here) and ever so quickly two others came into sight.

It was late afternoon, and the Bedouins had driven back to the downed fliers with their little old Datsun carrying two plastic jugs of water. It is the Bedouins' way not only to help, but also to be polite and sociable.

It was now decision time again. Could the western crew drink the local water and, if not, would the health penalties be worse than the risk.

"Shie Sadique, Shukron," said a MAG NCO. (Tea my friend, please.) He realized that the water would be made safe by boiling in the process of making tea, and further the bedouins love tea.

Just then a small twin engine plane quickly passed overhead. In their jubilation the survivors had forgotten to post their watch and now scrambled for what signaling devices they had left. A smoke flare was set off— to last only 20 seconds (that is all they are good for!) That was it! They could see the small aircraft, now executing a 180°, turn out to sea and head back. The young E-3 yelled— "Wave your shirts! Throw dust and sand into the air!" At that, the shoreline became a very busy place, and the small search aircraft pilot could detect the motion and see a shadow on the sand formed by the thrown dust.

With flap and gear down the small Piper Apache twin circled, as if to indicate to land, only to pull up its gear on the second pass and go into a low race track pattern. "He wants to land," the 130 copilot yelled. "Mark a runway— let's go."

In a flurry they took everything they could: Inflated LPU, raft canopy, rocks, and the little Datsun truck and in 10 minutes had layed out a rather short but nice area of the beach for a runway.

Another day at this level of activity and no water, and they would be killed by the blazing sun. Life with no water is dangerously short.

The loitering aircraft took a visual on their efforts, and now with a local military C-130 overhead, slowly and quietly it approached to land. Then the survivors realized that the small aircraft could only land at twilight when the land/sea breeze was at null point and that wind indication was critical. They pushed the raft onto their tea fire and the black smoke rose almost straight up. The canopy was torn apart and made into an approach end marker. Conditions looked good.

The small aircraft was down now and the government pilot explained

to them the difficult ATC problems in the area, and how their confirmed entry into the area was delayed due to international borders, new equipment installations, multinational training, security, and language difficulties. Everyone aboard the 130 should have realized these things prior to ever flying into the Middle East, but they had never given these conditions more than token thought.

In a matter of minutes all were taken into a near-by community to be treated to the greatest of hospitality and to later return home safely. Some survived — some had not.

Would you have survived?

Fictional but real. We as USAF crews operate into the Middle East daily, and from my own experience, I know we go there with an inordinate amount of disdain for any hazards.

Air Force survival training that I recollect applied to each "type of area." Desert training to deserts, sea to marine, winter to arctic but never sea and desert (and inland in winter arctic) together! (I might add that the central Arabian desert region temperatures in winter go below freezing with 15 to 30 knots winds, rather constantly.)

The Middle East flight scene is dangerous at best. First, the over-all complexity of flight operations overrides all matters. Operations are multi-national, multi-lingual, multi-operational and, in great part, lacking organized and international controls as pointed out in the Tehran Operations Conference. A good example is that one local southern mid-east small government tried to shoot down a commercial 747 "passing" in this area just last spring. Their ack ack was close enough to rock the plane! Secondly, the Northern Middle East area is terrorist prone, and thirdly, political borders are unstable.

What this gives to the crew is one very difficult safety and survival zone. For all intent and purposes there is no search air rescue capability anywhere in the Middle East. What is in place, is highly questionable.

As the former chief of flight safety training for one of the largest flight groups in the area, having lived there on the economy, and with 10 years of training pilots in flight safety, I must say flight crews going into the Middle East should do the following:

1. Expect little-or-no support. Think ahead. Do not take a problem into this area. Aircraft and crew support is nil.

2. Brief your crews thoroughly. ATC procedures in the Middle East are poor at best. (Our next midair could be there.)

3. Know the region you are going into.

   a. Get a thorough briefing on terrain. Many maps are unreliable in this area. Talk to someone who has flown the area.

   b. Know the local people, customs, traits, types and political affiliations. (This is a must and is in AFM 64-3.)

   c. Know (even a little bit) the language. Safety is communications.

In SEA it was ground fire that could get you. Well, in the Middle East area it's the fiery ground that will get you! It's hot, it's dry and it's, for the most part, desolate. Water and "100 don'ts" will keep you safe in the M.E. "Number one don't" — ; don't fly into the Middle East in ignorance!

POST SCRIPT

The photos in this article are from live sea-desert survival exercises conducted by the author for the Royal Government of Saudi Arabia.

ABOUT THE AUTHOR

Sergeant Ronald P. Barrett ... Ground Safety NCO for the 4... TAW, Richards-Gebaur AFB, ... He is president of the Saudi Aviation Maintenance Manufa... Association, was an Air Forc... navigator, and has trained cre... several airlines in survival training. ★

MESSAGE TRAFFIC

continued from page 16

1975, Germany: An RF-4... flying a local exercise low l... 500 feet and 400 knots attempted a 180 degree tu... abort the low level. He hit a... cloud covered hill in the tu...

1976, CONUS: An RF-4C... cancelled their IFR clearan... proceed on their briefed lo... level. The aircraft impacted... the crest of a cloud enshro... hill.

1977, CONUS: After con... into mountainous terrain in... marginal weather a flight o... F-4E's attempted to perform... 180 degree turn low level a... During the turn number two... impacted a ridge.

Each accident shows a s... induced pressure to accom... the mission: Get a bomb o... photograph the target, com... an ORI local exercise miss... get home fast, or fill anothe... square. The tragic point is, ... all occurred on peacetime training missions. ★

The name of the au... was inadvertently omi... from the article "Things ... Go Thump In Flight," app... ing on page 28 of the ... cember 1978 issue of A... *space Safety* magazine:
Captain Leland O. Sin...
4950th Test Wing
Wright-Patterson AFB,...

THE PROFESSIONAL APPROACH

orce Communications Service
AFB IL

rior to closure of the Instrument Flight Center, a concern arose over the number of accidents that have occurred during the aircrew's transi- from the instrument phase of an instrument ap- ch to the visual landing phase.

TRUMENT APPROACHES UNDER OR VISIBILITY

ıen flying a straight-in approach during clear lity conditions, the pilot has almost unlimited heral visual cues available for depth perception, al positioning, and motion sensing. Even so, ng length and width of unfamiliar runways can o erroneous perceptions of aircraft height above unway surface. A relatively wide runway may he illusion that the aircraft is below a normal ath; conversely a relatively narrow runway may he illusion of being high. With an awareness se illusions under unlimited visibility conditions, omes easy to appreciate a pilot's problem in a g situation in which the approach lights and y lights are the only cues available.

ument approach lights do not provide adequate l guidance to the pilot during low visibility nent approaches. In poor visibility, especially he runway surface is not visible, there simply t enough visual cues available to adequately ine vertical position or vertical motion. Studies hown that when an aircraft is at or near ap- minimums in conditions of limited visibility, dden appearance of runway lights often give the illusion of being high. They have also that when the approach lights become pilots tend to abandon their orientation with ic glidepath displays on their flight instruments and rely on the poor vertical cues that they see outside. Another similar situation occurs when a pilot flies into ground fog from above. If he initially sees the runway/approach lights, these cues will tend to disappear as he enters the fog bank. The loss of these visual cues will often induce the illusion or sensation of climbing. These situations of erroneous visual cues, convincing the pilot that the aircraft is above normal glidepath, generally result in a pushover reaction, an increase in the rate of descent, and a short or hard landing.

During periods of limited visibility, approach lighting is usually acquired when the aircraft is in close proximity to the ground or controlling obstacles. Under these conditions, an increase in the rate of descent may create a situation in which sufficient lift cannot be generated to break the rate of descent when the pilot realizes that the landing will not be at a desired point.

A primary method to prevent dangerously high rates of descent and short or hard landings is to maintain continuous crosscheck to an electronic glidepath and to the velocity indicator. The pilot should establish pre-determined limitations on maximum rate of descent for his aircraft that he will accept when landing out of a low visibility approach. Exceeding these limits during the transition to landing should result in a go-around and missed approach in the interest of aircraft and aircrew safety. Knowing that visual cues can be extremely erroneous, the pilot must continue to crosscheck instruments even after runway and/or approach lights have come into view. Most pilots find it extremely difficult to continue to crosscheck their flight instruments once the transition to the visual segment has been made, as their natural tendency is to believe the accuracy of their visual cues. In order to successfully continue reference VVI and/or GSI when approach lights come into view, a scan for outside references should be incorporated into the crosscheck at an early stage of the approach, even though restrictions to visibility may preclude the pilot from seeing any visual cues. If such a scan is developed into the crosscheck, it will facilitate the recheck of flight instruments for reassurances of glidepath orientation, once visual cues come into view and the visual transition is begun.

Further explanation of transitioning to the visual phase from the instrument phase of flight is explained and examined in AFM 51-37, paragraph 6-19. Most of the information in this article was contributed by Capt Rick Martin, ATC/DOTO, Randolph AFB, TX. ★

Mail & Miscellaneous

Send your ideas, comments, and questions
Editor, Aerospace Magazine
Norton, AFB, CA 92409

SAR PROCEDURES

In reference to your article in the Sept issue of *Aerospace Safety* titled "MAYDAY, MAYDAY—I'm Going To Ditch," I find it very difficult to understand why the SAR frogman punctured the life raft and life vest prior to pilot pickup. This is not taught at water survival school, and is highly frowned upon. According to the article, it was done to prevent either item from being sucked into the helicopter's rotors. This action should not occur as the rotors of a helicopter cause a down wash effect, blowing the life preserver units away from the chopper! It will not suck them up into the chopper. If this were to occur again, and in the process of pickup the helicopter were to experience trouble and go down, you would now have a man in the water, with no survival equipment. As a C-141 pilot, I transit the North Atlantic many times a month, and although we have never had to ditch, there could come a time when it might happen. I would hate to think that SAR would puncture our life rafts and preservers prior to pickup. The crew would be cold, wet, and tired, making it almost impossible to stay afloat without life support equipment. Had that Cessna pilot been in the water a while, exposure might have made him incapable of swimming and the frogman (although highly trained) would have had a difficult, if not impossible time, keeping the man afloat while trying to attach a horse collar. As it was the pilot swallowed a large amount of sea water. I recommend, if at all possible, a change to the article, or a change to SAR procedures, before an unnecessary tragedy occurs.

MICHAEL D. VARGO, Capt, USAF
Chief of Safety
18th Military Airlift Squadron
McGuire AFB, NJ

A check with our ARRS folks and the Navy Safety Center was made in regard to this article. Both organizations indicate that puncturing of the life preserver is neither taught nor recommended–Ed.

WEATHER CAUSES MOST GO-AROUNDS

Pilots recently queried by ALPA on the reasons for missed approaches under Category II and III weather conditions said poor visibility and other weather-related problems cause more go-arounds than any other factor.

Participants in the survey—all captains who fly Cat II and III approaches—said lack of visual cues is the chief cause of go-arounds, followed closely by unfavorable winds, turbulence and other weather hazards. The next most common reason is problems with cockpit equipment (malfunction in autopilot, flight director, etc.), followed by errors in air traffic control (bad vector, inadequate spacing, etc.) and problems with landing aids.

Altogether, the survey covered 72 missed approaches, almost 60% of which occurred below 200 feet. Of those, 39 (or 54% of the 72) occurred at 150 feet or lower while 31 (or 43%) occurred at 100 feet or lower.

In 58 cases, the pilot attempted a second approach, while in eight cases he diverted to another airport and in six he did not indicate (on the survey) what he did. Most of the second attempts (53) were successful.

Beginning last year, the Federal Aviation Administration (FAA) polled airport control towers on missed approaches during Cat II and Cat III operations, to determine how many go-arounds were pilot-initiated. During a seven-month period (September 1977-March 1978), FAA logged a total of 2,866 approaches (both general aviation and air carrier), of which 247 (about 9%) were not completed. These included misses initiated at the outer marker, Part 91 operators conducting lo and other situations where th elected to go around. . . . —Co *Air Line Pilot,* Oct 78. ★

ANSWERS to First Aid and S Self-test from Page 5.

1. 12-16 per minute.
2. 72/min.
3. With ease, about 1 minute.
4. One inflation-deflation; five co sions.
5. If without radios, signal dev mirrors, build a fire (or tria three fires), construct an SOS other signal with ground shad age, or snow.
6. When unequipped, use your h fingers.
7. Slow rate to around 12-16 a mined in question 1.
8. Involuntary muscular contra or twitching.
9. Try your stability in various p with eyes open and closed. find standing on one foot more when your eyes are closed. Fli ditions without full use of vis thus predisposing to spatial d tation.
10. **None** has been equated to a doses. A good rule is to **avo** foods (high in preservatives, color and flavor), animal fat, etc on the amount of your phys tivity, you should balance calori with high nutrition natural food include trace elements and a fiber.

EXTRA CREDIT:

Questions 2 and 3 relate as go cators. For example, take your p rest. If it is above 80 it means th heart muscle needs more exer minimum of 30 minutes of brisk daily is considered necessary to r the heart in good condition. If after o breath you cannot hold your breat for one minute, you probably need tests for possible emphysema, ove or heart problems.

SCORING:

Give yourself 1 to 11 points f reasonably correct answer. If you 11-10 points, you either already k information, or you took the time t out the answers! If you scored 8 o means that you either didn't have or clock within view, or were too impatient to figure out the answers

STATES AIR FORCE

Well Done Award

esented for

ding airmanship

professional

mance during

rdous situation

d for a

nt contribution

to the

ates Air Force

nt Prevention

rogram.

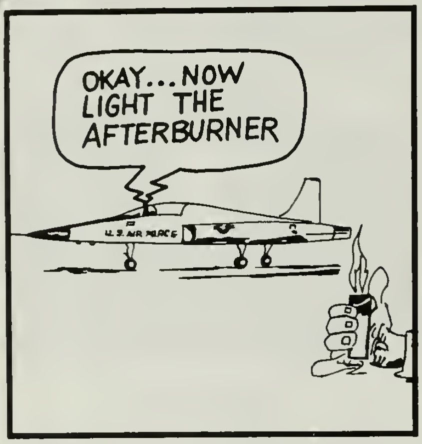
CAPTAIN
Edward B. Williston

CAPTAIN
John M. Nadolski

363d Tactical Reconnaissance Wing
Shaw Air Force Base, South Carolina

On 14 April 1978, Captains Williston and Nadolski were in the final portion of an instructor upgrade check flight. Captain Nadolski, in the rear cockpit of the RF-4C aircraft, had just completed a no-flap touch-and-go landing. As the aircraft broke ground there was a muffled explosion followed by a fire light on the left engine. The runway supervisory officer and the tower controllers radioed that the aircraft was on fire. Flames were streaming approximately 30 feet behind the aircraft. Captain Williston took control and requested a closed pattern as he selected afterburner on the right engine and idle on the left engine. Captain Nadolski confirmed fire coming from the left rear. The fire and fire lights persisted until Captain Williston shut the engine down. After shutdown the fire light went out, but as the aircraft gained closed downwind altitude the fire light came back on and the utility hydraulic pressure failed. Captain Nadolski could see smoke coming from the left side of the aircraft. Because they were so close to the field, they decided to set themselves up for landing with a single engine failure and utility hydraulic failure. Both crew members were required to hold full right rudder and nearly full right aileron to keep the aircraft from rolling inverted on final approach. Final approach was flown at 230 KIAS with touchdown planned at 191 KIAS. After touchdown both main tires blew, but the aircraft was kept on the runway by nose wheel steering and a departure end cable engagement was made at approximately 120 KIAS. After the aircraft stopped, tower radioed that there was fire around the right wheel. The crew members made an emergency egress. The source of the first fire and explosion was the failure of a "V" band coupling which connects the aircraft fuel system to the engine fuel system. When this coupling failed, raw fuel was dumped into the engine bay and onto the hot engine. The second fire and the utility hydraulic failure were caused by the burning of the auxiliary air door utility hydraulic line. This caused failure of the line and burning of hydraulic fluid in the left engine bay. The superb skill and excellent control exhibited by Captains Williston and Nadolski and their timely and decisive actions during this critical and potentially disastrous phase of flight prevented possible loss of life and resulted in the recovery of a valuable aircraft. WELL DONE! ★

OPS TOPICS



A FLICK OF SOMEONE'S BIC

An F-5E on takeoff roll was aborted on the runway when the left engine compressor stalled after the pilot selected afterburner. The aircraft was taxied clear of the runway and shut down. During local maintenance teardown, extensive FOD to the left engine compressor was discovered.

The FOD investigation team discovered tiny blue specks of what appeared to be melted plastic in the aft engine section. They were able to match the damage to the compressor blades to pieces of a disassembled "BIC" type disposable lighter. Further inspection of the inlet guide vanes (IGV) section indicated that the lighter was sitting between the IGVs and the first stage compressor blades at the time of the first engine rotation at engine start. With the lighter in this position, a pilot conducting his preflight would not detect it, and discovery would be extremely difficult by the plane captain during his preflight inspection.

The pilot did not carry a cigarette lighter and the plane captain emptied his pockets and was properly attired in appropriate clothing for the intake inspection.

The position of the lighter at initial engine rotation makes it highly improbable that it was dropped inadvertently into the intake by maintenance personnel. Two possibilities were mentioned that might account for the lighter's presence in the intake, although both were considered unlikely possibilities.

- It was blown from the ramp by a taxiing aircraft and went into the intake.
- It had been lost in the cockpit on a previous flight and had been ingested into the intake after landing when the canopy was opened.

Cost of this mishap amounted to $14,308 – an expensive "flick of the BIC." – Courtesy US Naval Safety Center *Weekly Summary*.

HARD TO BELIEVE

The pilot was preflighting the aircraft in preparation for an 0730 LCL departure. He squatted down to inspect the nose gear and used the propeller to help himself up. The magneto switch was on in the both position. The engine fired, causing the propeller to strike the pilot on the left side of his head. He survived, but we imagine the prop won't be the same.

THEY'RE STILL DOING IT!

A CT-39 had been cleared for takeoff and had commenced takeoff roll when a vehicle was observed, by the tower, passing the hold line and runway crossing lights at the main intersection of runway 12 and the closed runway 21. The aircraft was advised of the vehicle and takeoff clearance cancelled. The pilot immediately started braking and came to approximately 300 feet befo main intersection. The vehicle apparently saw the aircraft anc to an abrupt stop. Another go minder that "cleared for tak may not mean the concrete's

SAY IT LIKE IT IS

Poor communication beca non-precise terminology has factor in many aviation misha the air traffic control system t tion with any efficiency, ea volved person must clearly stand others with whom he is tact. Hence, standard termi and the need for each pilot an troller to know the right words. was some confusion when a pi clared an emergency with an A for low fuel. He did not s "emergency fuel." When th sage got to the destination to came on as minimum fuel. while, there was some confus tween the Center, Approach trol and the tower as to the ai location and the pilot's inte Twice the pilot told Center he runway 25 for a straight-in, tower never got the messag proach attempted to take the in on 25 for a vector to land 07. The pilot, meanwhile, ke ing he intended to land on 25. while, another landing aircra involved. It landed on 25 and at an intersection. Howeve emergency aircraft by then ready initiated a go-around. T turned out okay, other events sort haven't. To make a good pilots and controllers must sp same language.

OPS TOPICS

N TO HEAR

incident above illustrates one hazards of poor ATC—pilot nication. The following item t the same kind of problem ghtly different circumstances. ot misunderstood a clearance end to 3,500 ft and repeated everal times. The Approach er did not detect the mistake en the aircraft had descended), transferred the aircraft to R final controller. He re- the aircraft's altitude, re- 2,500 ft, and immediately a climb to 3,500 and a 90° pparently someone wasn't Similar mistakes have put nto mountains, the sea and leasant places for airplanes. r your life.

SHOW BIZ

days after a KC-135 had atic display, it lost the emer- pressurization door on take- ircraft would not pressurize; er checked and found the ing. The safety wire on the andle location on the pilot's panel had been broken, which was not noticed because it is not a checklist item and some aircraft don't have the wire. The unit has submitted an AFTO 22. We pass this item along because of the distinct possibility that one of the 50 or so folks who toured the aircraft pulled and replaced the emergency depressurization handle. This and similar incidents in the past indicate the wisdom of a very careful check after an aircraft has been on display.

80 OCTANE IS RED, 100 LOW LEAD IS PALE BLUE

There is no requirement, other than good sense, for aero club managers to label their fuel pumps as to the type of gasoline they dispense. Clubs are, after all, serving only their own aircraft and their own people, right? WRONG! TDY and personal travel to other bases is becoming common at several clubs. During a TDY to a midwestern base, an arriving aero club transient failed to note the color of the fuel from the unmarked pump until about two gallons had been dispensed. Defueling was completed and the potentially serious consequences avoided, but the lesson for aero club managers and fliers alike should be clear—know what you are putting into the tank. 80 octane fuel, sold by several clubs for their own aircraft, is not usable in many modern light aircraft. If your club sells it, be sure your transient trade knows what they are getting.—Capt Conrad A. Chapelle, AU, Maxwell AFB, AL.

REPLACEMENT FOR AGEING TRAINER EYED

WASHINGTON (AFNS)—Air Force is studying a new trainer aircraft to replace the 23-year-old T-37 if modifications to update that aircraft prove too expensive.

The "Trainer'X" or next generation trainer aircraft is to be developed for primary undergraduate pilot training conducted by Air Training Command (ATC).

Requests for proposals are expected to be issued to both engine and aircraft manufacturers for the design competition in the spring of 1979, officials said.

ANOTHER CLOSE ONE!

Reviewed approach control tapes. Air traffic intensity was moderate; controller workload was moderate. The controller stated that she would have provided the military aircraft an advisory on a VFR target but that another aircraft was busting its altitude at the same time and she had to work that problem first. *Both aircraft were flying within the legal constraints of the Federal Aviation regulations and Air Force regulations.* A probable midair collision was avoided via use of the "see and avoid" concept. ★

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SEE
AND
AVOID

AEROSPACE

ZINE FOR AIRCREWS

MARCH 1979

IS ISSUE: Illusions and Flight

MORE ABOUT WIND SHEAR HAZARDS

Wake Turbulence

The P.R.I.C.E. Is Right

A1C Arthur B. Hermanson
Physiological Training Unit • USAF Hosp. Ellsworth • Ellsworth AFB, SD

So there you are, a Physiological Training Specialist, a Chamber Ranger. You have innumerable hours of ''flight'' time inside the chamber. You are considered by your fellow workers to be one of the best in the field. And the classes you teach get critiques back saying how well you conduct classes and praising your ability to make everyone feel at ease inside the chamber.

So now you are inside the small compartment of the altitude chamber. The main flight is over and your group of refreshers are getting ready for their rapid decompression.

Everyone is settled down and has their equipment ready. The door is closed, the chamber has started up to 8,000 feet, and you have started your lecture. At 8,000 feet, you have once again explained the situation and procedure they must follow after a Rapid Decompression.

The Rapid Decompression has been fired. Everyone is getting their equipment hooked up to their faces. Everything is going smooth. A quick check with everyone, thumbs up, they are all okay. You tell the lock operator everything is all right and start for ground level.

About that time you notice something is wrong. There is a slight restriction to your breath Someone tells you your face is turning red, and you then notic some of your signs of hypoxia do a quick check of your equip and there is your problem. You CRU-60/P is not fully mated to supply hose. You connect the 60P properly and prepare yours for some ribbing from your fel workers.

The above incident actually happened. It is embarrassing, especially since you work with PRICE check and hypoxia alm daily.

The PRICE check is set up t work along with the aircraft's One. It is a very effective little check, and it does not take mo than just a couple of minutes to It could save you some embarrassment some day, and might even save your life.

One final point, and you hav heard it many a time before. '' can't happen to me.'' It can, it happens to those who teach saf habits in their daily routine. ★

PRICE CHECK

P	— **Pressure**	gauge check.
R	— **Regulator**	Perform blowback check on regulator hose in both norm and 100% positions, little or no resistance to blowing dicates a leaking diaphragm.
I	— **Indicator,**	with diluter in 100% position, check blinker.
C	— **Connections,**	check all connections, connector and quick-disconnect.
E	— **Emergency,**	check emergency oxygen supply and connections.

TED STATES AIR FORCE

AEROSPACE

SAFETY MAGAZINE

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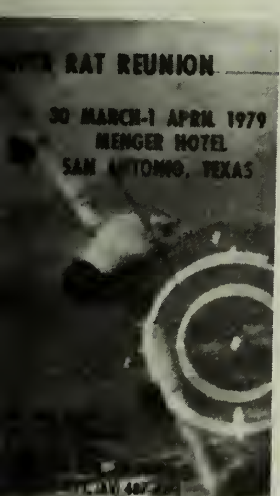

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page 14

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

Wake Turbulence

Major Jerry D. Driscoll
Directorate of Aerospace Safety

Since the advent of the jumbo jet, there has been an increased awareness of a phenomenon known as wake turbulence. Studies/tests performed by FAA using colored smoke showed some of the turbulence caused by the heavies. Since 1973 we've had a decrease in major accidents and reported incidents where the cause factor was wake turbulence. We had only one major accident where the wake turbulence was caused by a heavy, in this case a DC-10. In the recent past, however, there seems to be a possible trend involving—you guessed it—wake turbulence. The following major accidents have occurred since 1973:

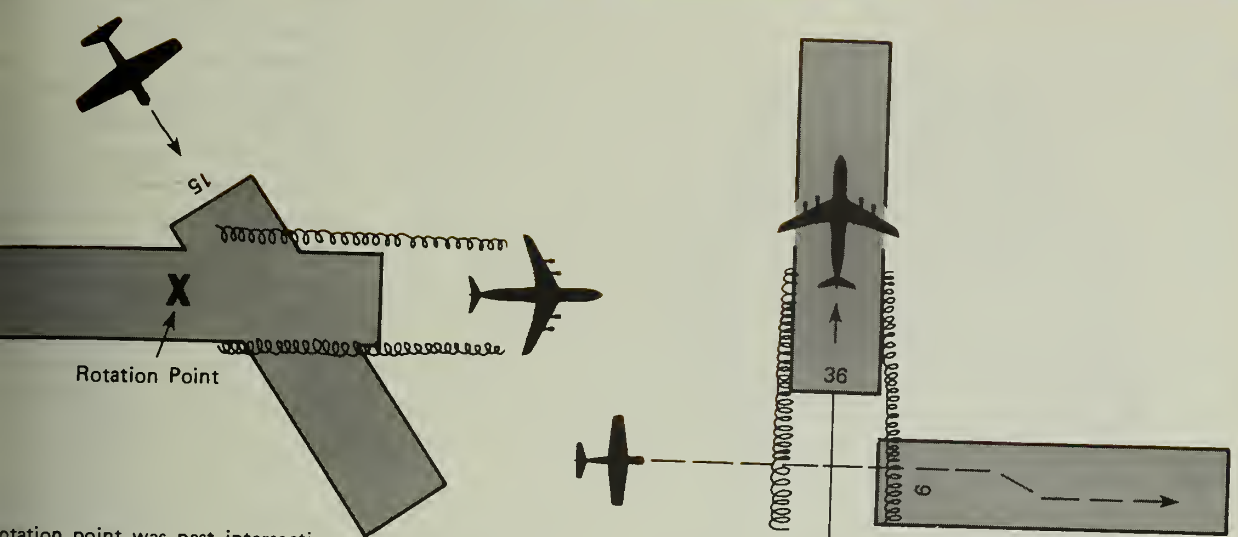
• T-38A. During a TACAN low approach in UPT, the aircraft was number 2 behind an L-382 (civilian stretch C-130). After reporting the FAF at 1.5 to 2 miles behind the L-382, the aircraft was observed to abruptly roll left to a 60 to 90 degree bank, slightly nose-low. The aircraft flew through some small trees, became airborne, then crashed, killing the crew.

• T-39B. During a transition training mission, the accident aircraft was making a VFR closed pattern at a civilian airport when a DC-10 was cleared for "the option" (touch-and-go or full stop landing) to the same runway. The T-39 was cleared as number 2 in traffic behind the DC-10 and turned final about 3 miles behind the DC-10. About 2 miles from the runway, after the tower operator cautioned of wake turbulence, the aircraft experienced a rapid roll to the left of about 120 degrees of bank. After recovery, the aircraft again rolled quickly to the left and descended. The pilots again recovered level flight, but too late to avoid impact with the ground.

• F-101F. While performing a formation takeoff, number 2 (who was down wind) dropped back because of being heavier and having a dissimilar configuration. As he dropped back, his aircraft became airborne in a semi-stalled, out-of-control condition. The left wing stall caused the aircraft to turn left, cross behind lead and become involved with lead's jet wash/engine exhaust. The aircraft exceeded the angle-of-attack limit, pitched up and crashed.

Related incidents included an F-106 that experienced wake turbulence from lead just p landing and crunched the t tion. An F-15 had a similar ence with wake turbuler final and damaged the rig wheel and strut assembly, F-111 was also the victim o wake turbulence. An F-105 a hard landing on its aft when it encountered wak bulence generated from erous C-130 takeoffs and ings. Flying through the je of one fighter by another in air engagements can cau over G condition, e.g., an corded 8 Gs during a gun ing position on another F F-5 pulled 10 Gs while tr an RF-4, but the one th ceived the heaviest load an to tell about it was an F-1 came back with an estir *12 Gs* encountered during tracking engagement. All examples occurred as a re flying through the jet wash loaded-up condition.

As you can see, most above damage was from fi encountering turbulence erated by other fighters. It's ject that should be contir covered at fly safe meeting in flight briefings. The exper



otation point was past intersection,
if prior to intersection, go around.

Cross above path of heavy aircraft.

vake turbulence from the big as been widely emphasized ias not been as big a prob- is originally thought. How- since wake turbulence can dire results for any air- here is a review just in case forgotten.

ke turbulence is primarily a ct of lift and takes the form tices rolling off the wingtips ailing behind the aircraft. eavier, slower and cleaner d, the stronger the vortices. aircraft moves forward the s are left behind and de- at about 400 to 500 feet per to about 900 feet below nerator's flight path. They ally dissipate, an action ned by atmospheric tur- e, but tests have shown still air behind a cruising air- he vortices may exist at up to 15 miles.

w altitudes the vortices ot have time to dissipate ill sink until they reach effect where they move y outward at about five n still air. Remember that wind could cause the up- rtex to remain on the run- d move the downwind vortex to a parallel runway. Or a tail wind could move the vortices of a preceding aircraft forward.

If you fly across dissipating vortices you may feel only a couple of mild bumps; however, wake turbulence can be extremely violent. So violent, in fact, that a light plane encounter could result in structural failure. The primary hazard for fighters and trainers is the possibility of loss of control. In tests at Edwards AFB an F-104 was rolled inverted and thrown down and out of the vortex so rapidly that response time was inadequate to arrest the reaction. In the traffic pattern this could be disastrous. NASA data records one case in which a nearly 100 degrees-per-second left roll rate was generated while the pilot was holding more than half right stick deflection.

While structural damage may result from a violent wake turbulence encounter, the biggest hazard when flying up the core of a vortex is induced roll. Long span aircraft have the best of it here in that if the ailerons extend beyond the vortex, counter control would be more effective than for short span aircraft which may have the entire wing span within the vortex. In the latter case, counter control capability may not be great enough to stop the roll.

To avoid wake turbulence, the following procedures are recommended:

- Vortex generation begins with the rotation and ends when the nose wheel touches down. So take off and land prior to the rotation point of aircraft on takeoff. Take off and land beyond the touchdown point of a landing aircraft. (See illustrations.)
- When a heavy aircraft has landed on an intersecting runway, cross above its flight path.
- When landing behind a heavy jet departing on a crossing runway, note his rotation point. If it was past the intersection you're okay; if it was prior to the intersection, stay above his flight path, or go around.
- At cruise altitude avoid flight below and behind a heavy jet, and/or offset laterally, preferably upwind.
- Avoid helicopter (1) downwash and (2) trailing vortices.
- Be alert to controller's warnings and obey all instructions pertaining to separation. ★

PILOT ERROR
The why behind the words

Captain Frank Walker
19th Bomb Wing
Robins AFB, GA

Although the author uses t phrase "Pilot Error" in this article, the Air Force has replaced that classificatior "Operations Factor, Opera Now that's a handful, espe if it is used frequently in a article. Therefore, we are retaining the author's "Pilo Error" for which the reade infer "Operations Factor, Operator."

A commercial airline cre crashes while handling minor emergency . . . ATC IP lands with the gear up . . . ; the crew of an AF transp flies into the side of a mountai . . . .

What do they all have in common? They all resulted fro pilot error. Yet what is pilot er The words themselves have a negative connotation. To most and crew members, it's a scape phrase used to place blame for mishap when no other reason f can be found. The purpose of t article is to show what Pilot Er and what a crew can do to avo

The brain is an extremely complex organ – we still don't understand all of its capability. for a pilot, the brain can be lik to a computer; it receives a sen input, analyzes it based on information stored in its memo bank, and then produces an ans While this may be a simplified view, it will explain how a sim input can be misinterpreted or blocked out. The result can be another unexplained mishap lab "PILOT ERROR."

The brain depends on stimuli transmitted from one of the five senses in order to make the decisions that the pilot needs in flight. With numerous inputs ev second, the brain sifts the input it receives and prioritizes them; stronger the stimulus, the better chance it has of getting through Once the stimulus is received, i remains until it is replaced by another stimulus. Normally, thi

urs when we change our attention omething else. For example, all s at one time have been engaged onversation at a party when we a really attractive member of the osite sex enter the room.

ough we are still listening, our ty to comprehend what is being disappears – a stronger ulus has replaced the original

the above case, one stimulus resses another that is still ically present. If the person s away, our attention will return e conversation. In the next ple, the stimulus is never ved to begin with. A classmate ne in pilot training was ious for his final turn gear call – made while the gear ng horn was beeping in his The concentration on a visual lus under the stress of being nd wanting to perform well etely blocked out all other y perceptions. The result was e really never "heard" the

ention stress – this is really art of pilot error. The stimuli ed by an individual under are normally heightened and ned. This is usually good, e it assists the individual to beyond his capabilities. But can also intensify the ms that were noted above. e concentration on an ncy can completely block a s from reaching the brain. If re crew is absorbed by the imulus, it is possible for no notice the aircraft deviating s flight path. And if the stress s great enough, the ual may react to no inputs npletely freeze up. The are equally disastrous.

is point many of you are "Aw, that could never on a crew aircraft where at e person would catch a ." Perhaps the following will make a believer of you me.

I was flying an "over-the-shoulder" flight on a B-52 crew returning to Guam after a 30-day stateside rotation. The copilot and navigator were lieutenants and the rest of the crew were majors, lieutenant colonels, and a tech sergeant. The copilot was making numerous mistakes during the flight and was becoming flustered since it was his first flight with the crew. The pilot briefed the TACAN approach and told the copilot that, when they intercepted the localizer, the copilot would fly the ILS and land.

As we intercepted the ILS, transfer of the controls was made and the copilot verbally acknowledged control of the aircraft. As we started down the glidepath, I mentioned to the copilot that he was getting a little bit low on the glide slope. When we passed one dot low, I again told him he was getting low. No one else had said anything to him until then. At this point the pilot said "get your nose up." The copilot looked at him and said, "I thought you were flying the aircraft." The pilot then muttered something unmentionable and landed. Weather was VFR the entire approach and I doubt we would have crashed, but had we had an emergency or been making an instrument approach, we might have been another undetermined mishap chalked up to pilot error.

We've seen so far that stress can accentuate the tendency of the brain to block or misinterpret stimuli but what can we do to avoid it? The first thing, of course, is awareness and that is what this article has tried to do. Following are some other ideas that a crew can use to ensure that it doesn't happen to them.

The best method to keep from concentrating on a single stimulus is to keep changing the stimulus periodically. One example is for the crew to clue the pilot flying the approach as to altitudes, headings, etc., and for the pilot to RESPOND ON INTERPHONE. This will make him break away from a visual stimulus to an aural one and will keep his cross-check from stagnating. Especially on a weather approach to minimums, a pilot should verbally inform the crew in order to keep from concentrating solely on one stimulus. And if it gets quiet for a long time, someone ought to say something, especially if a deviation is noted.

Another thing to avoid is saying things or doing things by rote without really concentrating on what it is we're saying. Many an ATC IP has heard his student say, "handle, horn, lights, light, pressure" in the T-37 and not have a down and locked indication because the IP pulled the gear indicator circuit breaker. After doing things the same way flight-after-flight, we see what we expect to see, whether it's really there or not. So take the time to really check a switch position or a light rather than to make a hurried glance. Because if you're concentrating on something else, what you think you saw may not be what you've got.

Probably the touchiest subject to talk about to a pilot is transferring control when things really go to hell. Every pilot should make sure that his copilot is aware of circumstances that would require a transfer of controls. The airlines use a "two communication rule." If the pilot flying the aircraft fails to respond to two communications in a row, whether they are internal or external communications, the other pilot is supposed to take control of the aircraft. No copilot should ever fear retaliation for taking the aircraft if he feels the pilot is not responding. It's a lot better to argue about it on the ground than to have him sit there and watch the pilot fly it into the ground.

Pilot Error will exist as long as we fly and only by acknowledging its existence and dealing with it can we avoid having our name listed in an accident report that reads CAUSE: PILOT ERROR. ★

Illusions and flight

After going around because the aircraft was high and fast, the pilot made another landing attempt. Again high and fast, but he elected to land. Subsequently, the aircraft went off the runway and sustained major damage.

The investigation board listed six causes, all of them Operations Factor, on the part of the A/C and the copilot. An item considered by the board, but rejected as a cause was a 1,700 ft obstacle within 4 NM of the runway. The copilot, who made the landing, apparently saw the obstacle as a greater hazard than it was. Nevertheless, he thought he had to stay high which led to a short, fast descent on final.

Most articles on illusions are confined to landing and takeoff problems. It is possible, however, for pilots to be deceived by various factors during other phases of flight. Most hazardous, possibly, is an illusion that affects a pilot's judgment during low level flight, particularly during weapons delivery and recovery. It is extremely difficult for a pilot to accurately judge height above the surface at high speed over calm water or featureless terrain such as some desert areas present.

The following material has been presented in some form in several publications including *Aerospace Safety*. But because accidents caused or contributed to by illusions continue to occur, we recommend all pilots read and heed. It deals with landing but holds for the other phases of flight mentioned above.

Visual illusions during the landing approach may be caused by one or any combination of the following features:

Sloping approach terrain
Sloping runways
Runway width
Rain on the windscreen
Featureless approach terrain
Runway lighting intensity
Shallow fog
Rain showers

SLOPING APPROACH TERRAIN

Normally, when a pilot m visual approach he subconsc judges the approach path f combination of the apparent d of the aircraft from the runwa its apparent height above t proach terrain. If the ground the aircraft slopes upwards t the threshold an illusion m created, particularly during th stages of the approach, that t craft is too high (see Figure 1) versely, ground which slopes wards towards the threshold the impression that the approac

Figure 1. UPSLOPE TERRAIN

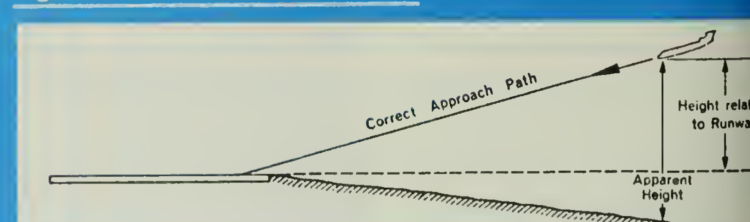
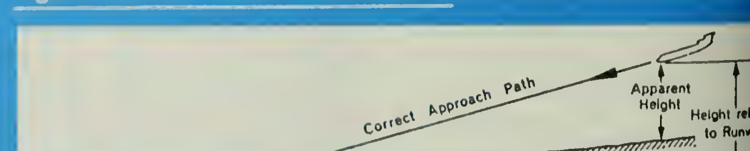


Figure 2. DOWNSLOPE TERRAIN



o flat (see Figure 2).

PING RUNWAYS

irough the regular use of ILS paths and VASIs pilots become stomed to a 3° glide slope and omplementary angle of 177° be- n the runway and the aircraft Figure 3). Additionally, from ex- nce pilots come to know with derable accuracy the amount of r required to maintain the cor- approach path to the point of idown. If, however, the run- slopes upwards from the land- hreshold and the 177° relative is used, a visual approach will wer than it should be (see Figure l the "usual" power setting will adequate to meet the require- of the flatter approach. If the ay has a down-slope, the con- applies (see Figure 5), so that aintaining the 177° angle rela- the down-sloping runway, the ach to the touchdown point steeper and the "usual" power in excess of that required.

ummary, an up-slope in either nway or approach terrain pro- a "too high" illusion; conver- down-slope in either produces low" illusion.

AY WIDTH

ability to use the apparent con- nce – due to perspective – of arallel lines to estimate their is well known. Increasing or sing the distance between the however, can create the illu- f shortening or lengthening On the approach, a pilot bases his judgment on a mental com- of the runway before him with ormal" view of the runways h he is accustomed. Variations runway width, therefore, can sleading. For example, the he runway, the shorter it ap- moreover, the width can also n effect upon the apparent of the aircraft in relation to way, a wider runway mak- ircraft appear lower than it is.

y rain can affect the pilot's ion of distance from the approach or runway lights by diffusing the flow of the lights and causing them to appear less intense. This may lead him to suppose that the lights are farther away than in fact they are. On the other hand, only a little scattering due to water on the windscreen can cause runway lights to bloom and double their apparent size, with the result that the pilot believes that he is closer to the runway than he actually is, leading possibly to a premature descent. Similarly, rain on the windscreen can cause illusions as a result of light-ray refraction. For instance, even though an aircraft is correctly aligned on the approach path it can appear to the pilot to be above or below the correct glide slope or left or right of the runway center line depending upon the slope of the windscreen or other circumstances. The apparent error might be as much as 200 feet at a distance of one mile from runway threshold.

FEATURELESS APPROACH TERRAIN

Visual descents over calm seas, deserts or snow, or over unlit terrain at night, can be hazardous even in good visibility. The absence of external vertical references makes judgment of height difficult and the pilot may have the illusion of being at a greater height than is actually the case, leading to a premature or too-rapid descent. Height above the runway is also made more difficult to judge if, because of snow for example, there is no contrast between the runway surface and surrounding terrain. The problem is compounded if the descent is made into sun or in any conditions which reduce forward visibility.

RUNWAY LIGHTING INTENSITY

Because bright lights appear

Figure 3. LEVEL RUNWAY

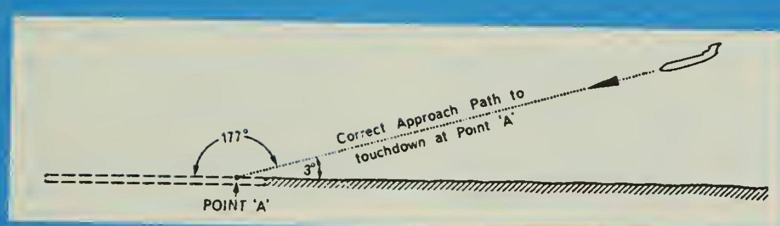


Figure 4. RUNWAY WITH UPSLOPE

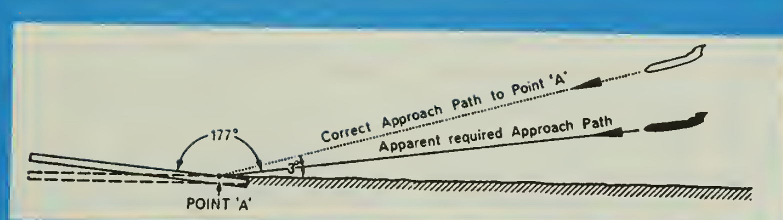
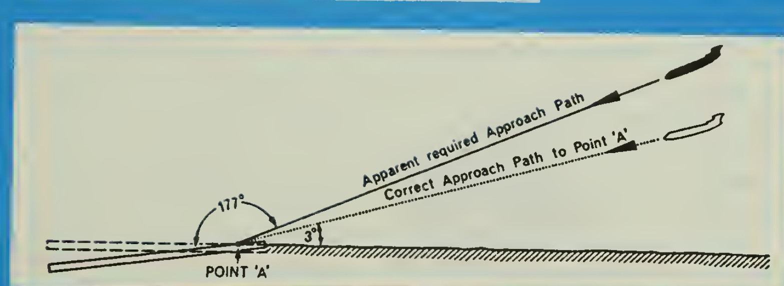


Figure 5. RUNWAY WITH DOWNSLOPE



closer to the observer and dimmer lights farther away, the intensity of the approach and runway lighting can create illusions. Thus, on a clear night, the runway lights may appear closer than they actually are, particularly when there are no lights in the surrounding area.

SHALLOW FOG

In shallow fog conditions, especially at night, the whole of the approach and/or runway lighting may be visible from a considerable distance on the approach even though Runway Visual Range or meteorological reports indicate the presence of fog. On descent into such a fog layer, the visual reference available is likely to diminish rapidly, in extreme cases reducing from the full length of the approach lights to a very small segment. This is likely to cause an illusion that the aircraft has pitched nose up, which may induce a pilot to make a corrective movement in the opposite direction. The risk of striking the ground with a high rate of descent as a result of this erroneous correction is very real.

RAIN SHOWERS

A weather feature which may reinforce a pilot's visual indications that he need not apply power to reach the runway or to arrest a high rate of descent is an isolated rain shower. A heavy rainstorm moving towards an aircraft can cause a shortening of the pilot's visual segment—that distance along the surface visible to the pilot over the nose of the aircraft. This can produce the illusion that the horizon is moving lower and, as a result, is often misinterpreted as an aircraft pitch change in the nose-up direction. The natural response by a pilot would be to lower the nose or to decrease, not increase, power.

Although it is essential to appreciate the nature of visual illusions which adversely affect judgment of the landing approach, pilots should also be aware of other illusory phenomena which may occur during level flight. False perceptions of attitude or misinterpretation of external visual cues can be induced by:

Horizons formed by layer clouds
Autokinesis
High altitude
High speed flight

HORIZONS FORMED BY LAYER CLOUDS

A pilot flying between layers of cloud with no natural horizon visible may tend to use the clouds as a substitute horizon. Since cloud layers often lie at a considerable angle to the earth's surface, the aircraft may be aligned with a false reference and fly with one wing low.

AUTOKINESIS

This illusion occurs when a small source of light is viewed against a uniformly dark background. It is not related to either the motion or the acceleration to which the observer is subjected and takes the form of an aimless wandering of the light source. At night this could be interpreted by a pilot as the movement of another aircraft. Consequently any steady fixation of the light source should be avoided; movement of the eyes, head and body greatly reduce the effect of the illusion.

HIGH ALTITUDE

At high altitude, where there is often little or nothing in the distance on which to focus, the eye tends to adopt its normal resting level and focus only a few feet ahead. In order to re-focus the eye at infinity and search successfully for an, as yet unseen, aircraft, it is not enough simply to look into the distance because this can never make the eye muscles relax sufficiently; on the contrary, it is likely to have the opposite effect and bring the point of focus even nearer than the normal resting level. The only sure way of focusing the eye at infinity is to interrupt the distant scanning by looking at a definite external object (such as clouds, vapor trails, the ground, even wing visible, etc.) which is at least away, and this should be done 3 or 4 seconds during the sear tern.

Other high altitude flying pr include the fact that the hori depressed with respect to th horizontal, so that orientation false reference may result in t craft being flown with one low or in a nosedown attitu addition, objects such as the m stars which a pilot normally e to see above the horizontal a may appear below it and so der a false perception of the air attitude.

HIGH SPEED FLIGHT

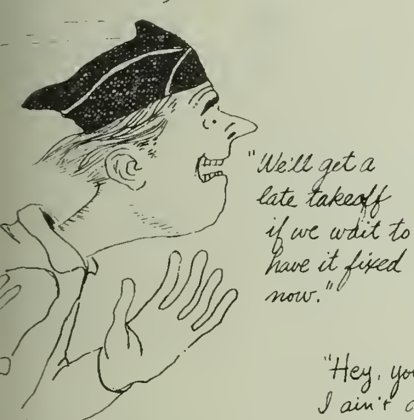
As the speed of flight increa is no longer valid to think in te an instantaneous visual picture elapsed time between initial p tion of an external object a recognition becomes significan in the case of collision courses tional time will be required to al aircraft's line of flight. The pr becomes more serious at high al where it is difficult to judge dis relative speed and size of an when it is seen against an empty field.

A pilot's susceptibility to the sions described above will d largely on the amount and natu his flying experience, although factors such as fatigue, poor adaptation and the absence of slope guidance tend to exace the problem. Careful preflight ning, including checks of the ability of visual and instrumen proach aids at the destination drome, the physical characteristi its runway(s) and the nature o surrounding terrain will do mu overcome the hazards, as will maintenance of instrument fl competence. *(British Airways* Safety Review.) ★

AIR·CREW DIC·TION·AR·Y

ajor David V. Froehlich • Directorate of Aerospace Safety

We'd like to pass on some handy one-liners which could prove useful to aircrew members. el free to use them (no charge) the xt time you shirk responsibility, take short cut, skip a procedure, or "don't ve time."



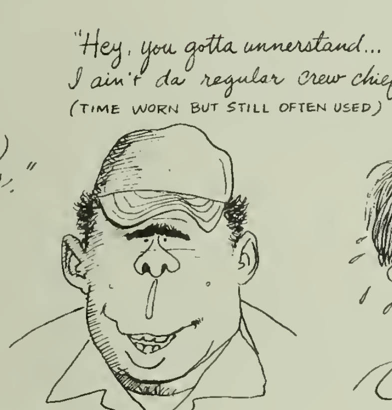
WITTY SAYINGS JUST BEFORE AN ACCIDENT

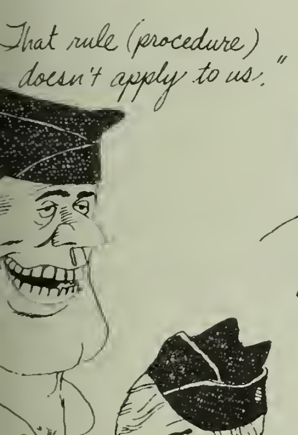
- "We don't do things that way here!"
- "That rule (procedure) doesn't apply to us."
- "I'm not the regular crew chief." (Time worn but still often used.)
- "I wasn't here then; the guy before me must of . . ."
- "It looks O.K. to me."
- "I think it will be all right."
- "It's VFR today anyway."
- "We'll get a late takeoff if we wait to have it fixed."
- "They didn't write it up on the last flight."
- "You do the inside and I'll do a quick walkaround."
- "Don't sweat the details."
- "That shouldn't bother us."
- "2500 hours in this bird; I don't need the checklist anymore."
- "Let me show you the way we used to do it in the old days."
- "It'll be close, but we can make it."
- "I haven't had much time to hit the books."
- "This bird can take it."
- "We've got plenty of gas left."
- "If I wore all that cold weather junk, I'd really be uncomfortable in the cockpit."
- "We'd never get done if we did everything the book says."
- "We'll probably get a vector anyway."

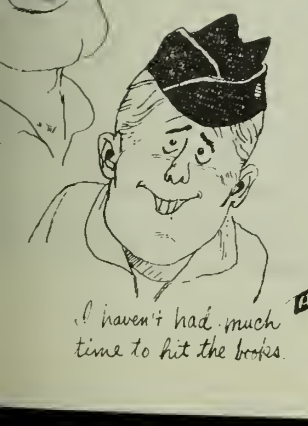
QUICK ANSWERS FOR THE ACCIDENT BOARD:

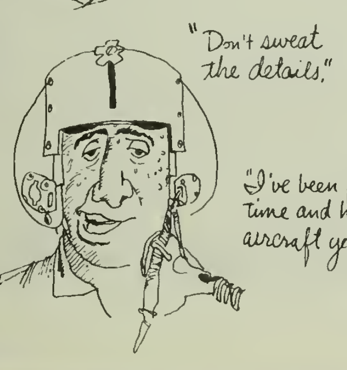
- "The weather was supposed to come up."
- "But the tower told me to expedite!"
- "But I've done that thousands of times."
- "There was plenty of fuel at the fix."
- "I'm sure I looked at the lights . . ."
- "The runway didn't look wet (icy)."
- "I didn't have time to run (finish) the checklist."
- "We've never done that before, and we haven't lost one."
- "Uh, a new dash one change (FCIF item); I don't think I saw that."
- "I was sure we could make it."
- "It wasn't in the forms."
- "It was VFR, so I took it."

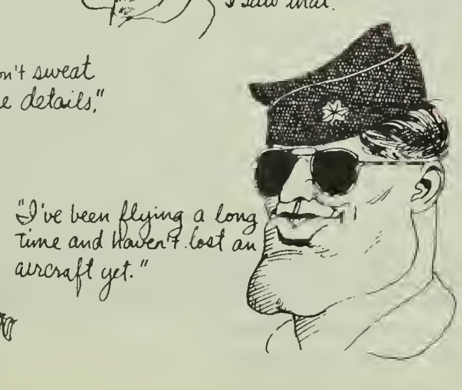
We know that the above won't cover all possible foul-ups, but we're sure that aircrew imagination will fill the gaps. Seriously, we pass these on in the hope that the next time you catch yourself cutting corners, you remember this article and maybe you won't become a statistic! ★

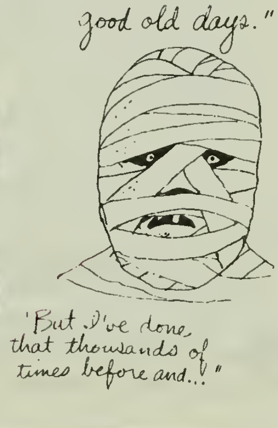












OPS TOPICS

SLICK RUNWAYS

Several incidents and Class B/C mishaps lately have revolved around a combination of wet/icy runway problems and heavy rubber deposits. A good point for aviators – RCR measurement *is not* and *never will be* an exact science. It is an average of readings and, therefore, cannot possibly reflect the conditions on every portion of the runway. Rubber deposits under water/slush/patchy snow can greatly affect your stopping ability toward the end of the concrete slab. The RCR "measurer" may not have driven over that one spot that will getcha!

Moral – obtain all possible info before your approach (a good peek or low approach and a few PIREPs may prevent a slide) and then use all recommended wet/icy runway or min run procedures as prescribed for your machine. Don't be too proud to go somewhere else. "But he said the RCR was a 12," won't keep it from being "OPERATOR ERROR."

COCKPIT FOD

Following a low approach from a PAR, the pilot was repositioning for a TACAN approach. As he placed the control stick to the left, he noted a slight momentary binding as the stick passed half travel in his intended 30 degree bank turn. The pilot investigated and noted that there appeared to be no screws securing the control stick cover assembly; he performed a flight control check, but the binding was not again immediately noted. As the pilot initiated a left turn to RTB he noted that the stick "froze" in a 20 degree left bank position. Looking down at the base of the stick, he saw that the cover had slipped down around the base causing the binding. He reached down and vigorously moved the cover around, finally freeing it, and was able to retain control of the aircraft and accomplished a successful approach and landing. Could've been a mishap!

MIDAIR PREVENTION

We have had several requests for ideas on how to generate a local campaign to prevent midair collisions. Our folks are aware of the potential consequences of a collision between an AF aircraft and a civilian plane. Lt Col Bob Gardner's article on how to have a fly-in, *Aerospace Safety,* December 1978, gave some pointers. Here's another idea and the action that prompted it. One of our F-4s was on down wind for a touch and go when he spotted a civilian plane, slightly low on his right and making a climbing left turn. The F-4 pilot took evasive action and notified the tower. The aircraft was identified and the pilot contacted. He said he knew F-4s would be active in the area and he looked for them. Upon spotting one he took necessary evasive action. Both aircraft were operating IAW existing rules and procedures. The incident happened because both aircrews failed to see each other in time to avoid a near miss.

Now back to ideas on how t prevent such incidents. The c pilot, an IP at a nearby airpo another instructor were invited base where they were briefed operations and patterns. Also, tailed public briefing was sch for all operators at the general a field. If you have any ideas th think others could use, let us hea you. We'll pass them on. *Aer Safety: AUTOVON 876-2633.*

THREE FOR ONE

One mishap is bad enough three – within 30 minutes – cause – three different aircraft – place?

The missions were similar – routine local training mission," a training mission," ". . . local proficiency sortie." The aircraft two C-130's, one from another ice, and a C-9. All struck a BAK-13 arresting cable. All rec damage to antennas. Barrier m nance personnel were standing b the runway waiting to cross to ti the cable; however, heavy traffic cluded their crossing. Rather drive around the runway, they tinued to wait. Policy at this base is for the runway to be closed there are arresting gear prob until they are corrected.

OPS TOPICS

EMERGENCY [BR]AKE VALVE

[A] recent F-4 mishap has identified [the] need for additional training for [air]crew members and maintenance [perso]nnel in the operation and correct [posit]ioning of the emergency brake [contr]ol valve. In this incident the emer[gency] brake handles in the cockpit ap[peare]d to be in on preflight. However, [on la]nding only emergency braking [was a]vailable which resulted in blown [tires.] Only through the pilot's skill did [the ai]rcraft remain on the runway.

The consequence of inadvertent emergency brakes being selected could be far more serious than one or two blown tires. The importance of understanding the operation of and the correct position of the emergency brake control valve cannot be overemphasized. This valve is located on the upper left side of the nose wheel well (see Fig 1) and the position of the valve arm must be checked to ensure it is in the *aft position* for normal braking.

Once the emergency brake handle has been pulled, the control valve is positioned for emergency operation and then can *only be reset from the nose wheel well.* It is often possible for the cockpit brake handles to be pushed back in but you will still not have normal braking unless the valve is manually reset.

Additional training for both crew members and maintenance personnel using a static aircraft is highly recommended to ensure that all are completely familiar with the required position of the valve to be checked for on each preflight.

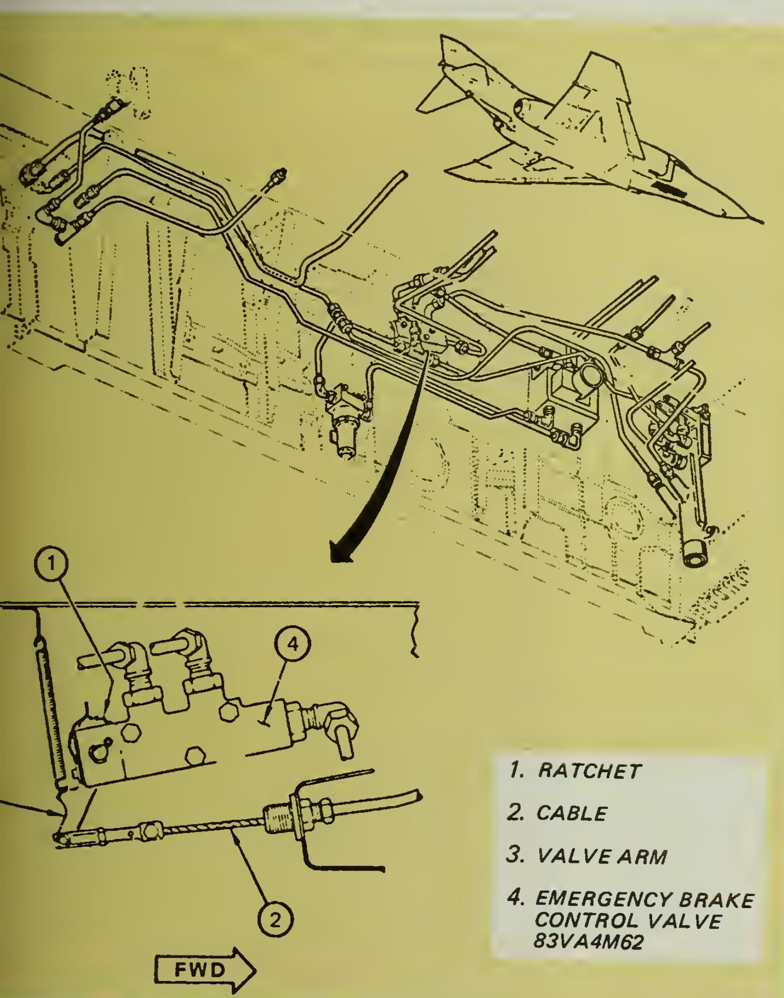


Figure 1. Emergency Brake Control Valve Rigging

FAA/NOAA TEST LOW-COST AUTOMATED WEATHER SYSTEM

The Federal Aviation Administration and the National Oceanic and Atmospheric Administration have begun testing a low-cost airport weather information system that uses a computer generated voice to brief pilots on wind conditions and provide them with accurate altimeter settings.

Called WAVE—for Wind, Altimeter, Voice Equipment—the system consists of sensors that collect data on wind speed and direction and barometric pressure readings in the vicinity of the airport. This data is fed into a small computer and a weather announcement is generated for broadcast once each minute over a radio navigation aid.

When airport personnel are on duty to provide the information, the broadcast also will include a recommendation of the best runway to use under existing wind conditions.

En route pilots can hear the weather report when they fly into the range of the Frederick, MD, Airport VOR navigation aid, an antenna which transmits in all directions on 109.0 VHF. ★

THE PROFESSIONAL APPROACH

Air Force Communications Service • Scott AFB, IL

The care and feeding of three Air Force publications, AFM 51-37, Instrument Flying; AFR 60-16, General Flight Rules; and AFP 60-19, Pilots Annual Instrument Refresher Course, has been delegated to Air Training Command (ATC). The following are some instrument related questions which have come to ATC and their answers:

Q. Am I expected to continue to comply with altitude restrictions associated with a Standard Instrument Departure (SID) when vectored off the SID?

A. No. FAA Handbook 7110.65A, Air Traffic Control, provides the following guidance to air traffic controllers: "When route or altitude in a previously issued clearance is amended, restate all applicable altitude restrictions." The pilot, however, should pay attention. If the controller states "Expect to resume (route, SID, STAR, etc.,)" keep the SID or STAR handy! Later, the controller may instruct you "Resume SID/Transition/STAR/Procedure." If the controller adds," . . . Comply with restrictions" you will be expected to comply with all route/altitude restrictions associated with the SID/etc. This guidance will be further explained in the next revision to AFM 51-37, Instrument Flying, expected in midyear 1979.

Q. When flying an approach such as the HI-TACAN Rwy 15, or ILS/DME, Kelly AFB, when can I descend from the 4,000′ mandatory altitude on the arc? (See Fig 1)

A. An arc or radial altitude restriction only applies while established on that segment of the approach. Once a lead point is reached, and a turn to the next segment is initiated, the pilot may descend to the next applicable altitude restriction. This may be especially important to facilitate a reasonable rate of descent to final approach fix altitude. The obstruction clearance pro is more than adequate for descent prior to established on the next segment unless you point has been grossly miscomputed. This ance will be further explained in the upc revision to AFM 51-37.

Q. I am enroute at 8,000′ MSL with radio fa The minimum enroute altitude (MEA) for the route segment is 12,000′ MSL. Where do I my climb and what rate of climb am I expect maintain to assure obstruction clearance?

A. The pilot should not begin a climb to the route segment MEA when radio out until b ning that route segment, unless the aircraft capable of the following climb rates while from one MEA to another:

Sea level through 5,000 feet	**150 feet per Nautic**
5,000 through 10,000 feet	**120 feet per Nautic**
10,000 feet and over	**100 feet per Nautic**

If a greater climb rate than those ment above is required for obstruction clearanc enroute chart will specify a Minimum Cr Altitude (MCA) at a particular fix to facilita struction clearance. ★

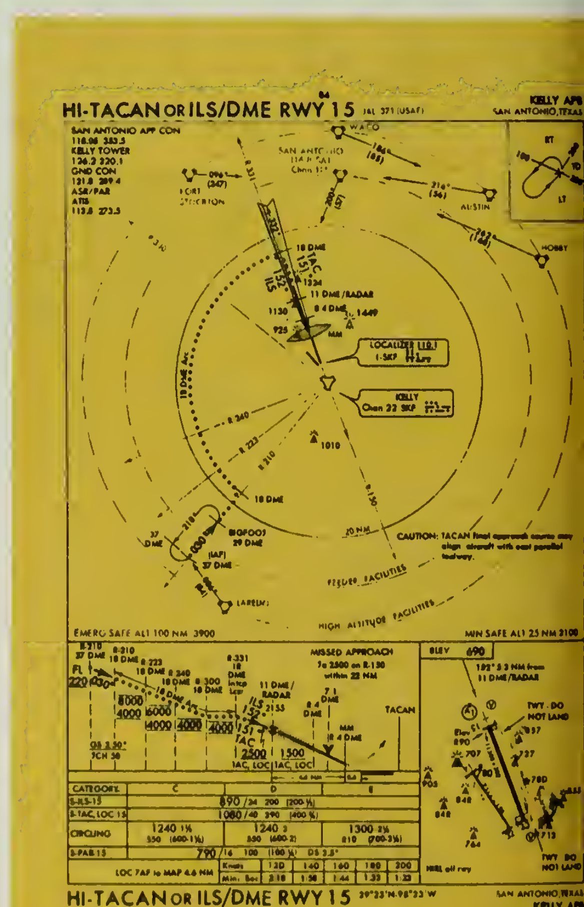


Fig. 1

Evasion of Another Kind

SSgt William R. Beier
Instructor Training Branch
3636th Combat Crew Training Wing • Fairchild AFB, WA

enerally, when aircrew members think of "evasion," they envision themselves g under vegetation, sneaking gh the trees or finding thing that will conceal them the enemy. They see selves as miserable or right uncomfortable, to say the This perception isn't ising for that's the way evasion racticed – and successfully – any in Southeast Asia. ever, we need to remind lves, "THAT was Southeast " What about a new and ent hostile environment? g behind rocks, trees, or under s may not always work; then ould find yourself dealing with ligenous group of Assisted on Force (AEF) personnel. ring the joint service exercise, Shield, many Air Force w members participated in an tional assisted evasion force rio. Due to resources, time, afety, the AEF portion of the se was limited; however, the and meaning were obvious. personnel found themselves in tion of not knowing what to t next, and asking themselves, at am I supposed to do?" For ajority, this was a new ience as it dealt with ventional guerrilla warfare and not merely moving from point "A" to point "B" via flight boot express. Instead, it fell within the framework of being transported from one place to another by indigenous personnel under some very unusual circumstances. The very few of us who had prior experience or knowledge of AEF soon realized how very fortunate we were, for we recognized the disastrous consequences which could result from being ill-prepared. The greatest lesson we learned as participants was that ignorance of your personal responsibilities could spell disaster for you, the AEF personnel, and their system.

What are your responsibilities if you find yourself in an AEF net? Your best reference is AFM 200-3, Joint Worldwide Evasion and Escape Manual. Because of its classification, this manual will most likely be found only in the local intelligence library. However, if you're in a position where time seems to be a rare commodity, here are a few helpful hints from Army FM 21-76, Survival Evasion and Escape. *First,* remember there's no rush. Delays within the AEF system can and should be expected. This promotes the concept that a sure move is a safe move. Impatience on your part could endanger all concerned.

Second, orders from AEF must be followed explicitly, for AEF personnel will protect your identity or attempt to conceal you among the indigenous population (reference *Aerospace Safety,* Oct 78, The Great Escape). However, you must always use sound judgment for you are accountable when all is said and done.

Third, have a *personal plan* for escape in case the enemy disrupts the system. In some very rare cases, AEF personnel might even have to make it look like they *captured* you and turn you over to the enemy in order to preserve the system so it can save other lives. *Last,* but not least, anything you see or hear must be protected, especially if you are captured by the enemy while working with the AEF. However, you can be sure AEF will tell you only what you need to know. And you'll have little to say to the AEF people with the exception of helping to establish your identity and making requests to ensure your health and welfare.

In the next conflict, AEF may be a reality. It differs a great deal from the one man "Sneaky Pete." If you know your responsibilities within the AEF system, you'll be ready for "evasion of another kind." ★

MORE ABOUT WIND SHEAR HAZARDS

By Paul R. Higgins and Donald H. Patterson

Wind shear during approach and takeoff continues to be of serious concern to all segments of aviation. New findings in meteorology have added to our understanding of this hazard. The following article adds to our knowledge of how to best control the aircraft in a severe downdraft. Although it deals specifically with the Boeing 727, the basic procedures would apply equally to other aircraft. We are reprinting this article from the **Boeing Airliner** ***in the belief that it will add to our understanding of the wind shear phenomenon and how to deal with it. The article is purely educational and nothing in it should supersede Dash One provisions or any other Air Force/Command directives. Our appreciation to the authors and the Boeing Aircraft Company for reprint permission.***

Some readers have voiced disagreement with certain of the conclusions reached by The Boeing Commercial Airplane Company relative to flying in severe wind shear conditions. The intent of the *Boeing Airliner* article of January 1977, entitled, "Hazards of Landing Approaches and Takeoffs in a Wind Shear Environment" was to provide pilots with a few ideas for consideration, which, if implemented would aid in avoiding catastrophe if their aircraft were inadvertently caught in some combination of severe downdraft and/or severe wind shea resulted in high rates of descent and/or severe loss c speed, especially when within approximately 400 f the ground.

Discussions of both the way to recognize a wind environment and the proper control of an aircraft severe wind shear or downdraft after the environmen been recognized can be complicated and controve The general subject is difficult to explain when usin simplified aerodynamics usually presented in pilot ing courses. It is necessary to go one step further in to acquire a better understanding of the best procedu use unless a pilot has already acquired that know through flying in such conditions. Today's aircraf usually fly over or around such conditions, so the p bilities of getting experience by forced penetration th the lower levels of thunderstorms at 10,000 to 20,00 of altitude are rare compared to 30 years ago.

Since the opportunities to gain flight experien severe wind shear are rare, and since those opportu now appear to exist only at times when the aircraft approach to landing or in the process of takeoff, it i sirable to provide supplementary data and training to c so that their first encounter will have a successful

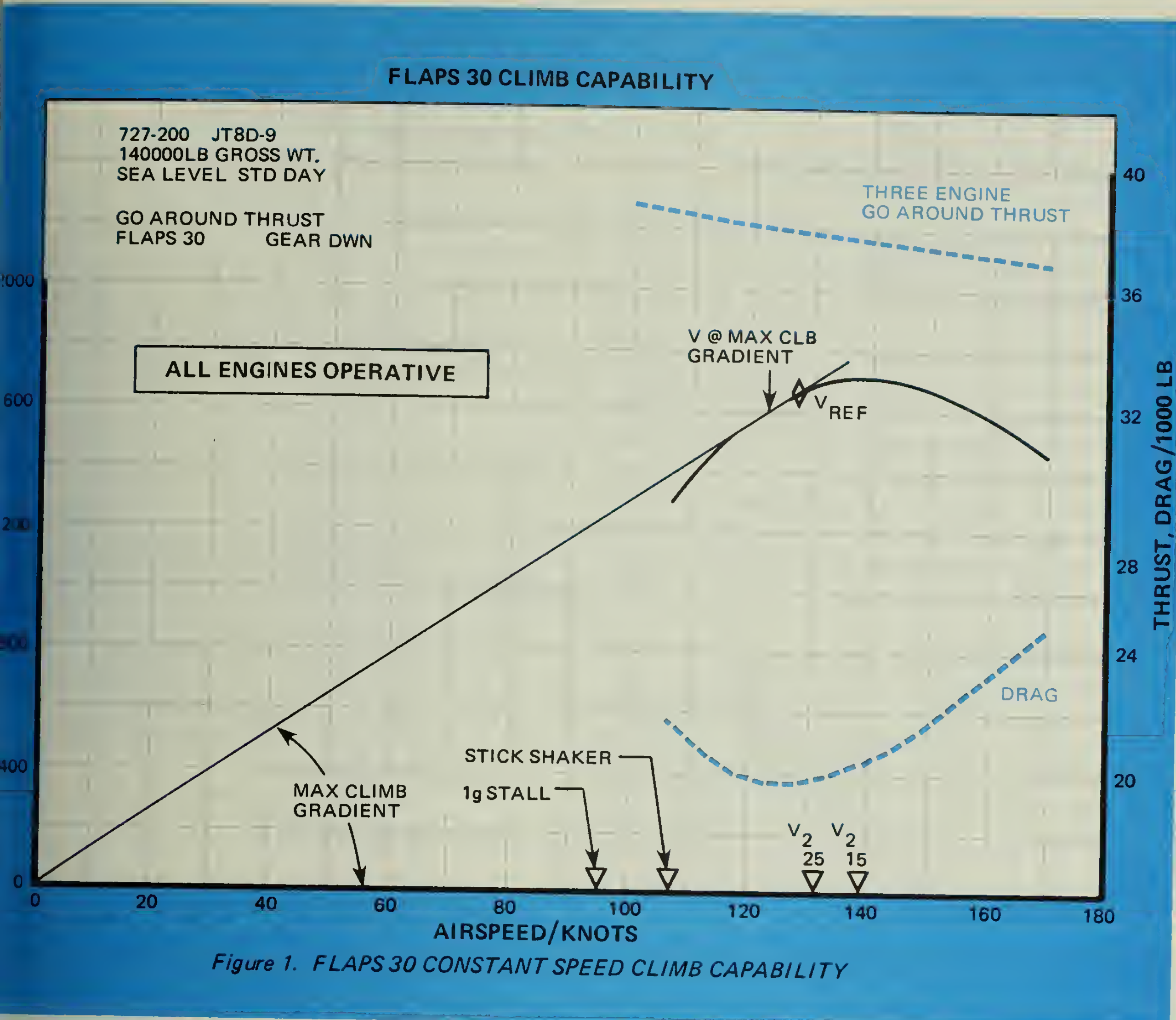


Figure 1. FLAPS 30 CONSTANT SPEED CLIMB CAPABILITY

n. The previous *Airliner* article was a step in that ion to assist the crews in acquiring a better underng, but it appears that some pilots may yet be having ılty in agreeing with the Boeing concepts. Additional ementary discussion and examples of airplane pernce have been prepared to help pilots understand ta and concepts presented in that article.

C PERFORMANCE CONSIDERATIONS

ts are familiar with thrust, drag, and rate of climb ow these quantities vary with airspeed. Figure 1 the rate-of-climb capability at various airspeeds of with JT8D-9 engines at 140,000 lb gross weight on evel standard day. The airplane is in its normal landnfiguration with gear down and flaps at 30°. It will ed that if a straight line is drawn from the zero airpoint and the zero rate-of-climb point up to where omes just tangent to the rate-of-climb curve, there rently only one speed at which it is possible to ate maximum angle of climb. At any other speed, gle of climb is going to be less than for that speed.

However, it should also be apparent that for other speeds that vary from stick-shaker speed of about 108 knots all the way up to maximum rate-of-climb speed and a little bit above, the angle of climb does not change greatly. This confirms one of the main points of the previous *Airliner* article, which emphasized the good climb performance available at stick-shaker speeds.

Also shown in Figure 1 are the go-around thrust and drag variations with airspeed. The drag that is shown is that which the airplane would experience in stabilized 1-g flight at a constant speed while travelling on any straight flight path on which it is possible to stabilize at the constant speed, be it up, down or level. The rate-of-climb capability exceeds the 1-g flight drag. It is apparent that the maximum difference between the drag and the thrust occurs in the region where the maximum angle of climb occurs, at about 124 knots, a speed slightly less than the minimum drag speed. In addition, because the rate-of-climb depends on the product of thrust-minus-drag and airspeed, (T-D)V, the maximum rate of climb occurs where that product is greatest, in this case, at 140 knots.

AIRPLANE ENERGY MANAGEMENT CONCEPTS

Most pilots will probably find the 727 airplane easiest to fly in the approach condition at flaps 30 at about 40 knots, which is about 12 knots above V_{REF}. This follows from the fact that if there are any airspeed changes due to gusts (at least for a small gust of $\pm$ 10 knots), the airplane would want to return to the original speed. This characteristic results principally from the shape of the drag curve at 140 knots as shown in Figure 1. If a speed increase occurs due to a gust, the drag would also increase and tend to decelerate the airplane back to the original speed. Similarly, with an airspeed decrease, the lower drag of the reduced speed would accelerate the airplane back to the original airspeed.

The airplane is described as having speed stability in this region, and pilots like to fly in this region because it is easier. There are those who use the energy management concept discussed above and the argument of speed stability to support a viewpoint that airplanes should be flown faster during the approach. Some degree of speed stability is desirable, but it is far overrated as a necessary flight characteristic and is certainly not important enough to warrant imposing the risk of an overrun on all landings.

However, there is another way to look at airplane energy management that is helpful. This concept asks the pilot to constantly keep in mind the aerodynamic viewpoint that the elevators are the means of controlling airspeed. Aerodynamically, the elevators and the stabilizer trim determine the angle of attack, and so they fix the speed at which the airplane will fly under stabilized conditions in calm air at constant thrust. In addition, it is the thrust setting that determines whether the airplane climbs or descends. Remembering that the elevators control the airspeed and that thrust controls the rate of climb or descent makes it relatively easy to fly on the back side of the drag curve. That philosophy is also quite easy to use on the front, or high-speed side of the drag curve and makes it easier to relate to the basic instruments in the airplane because airspeed and elevators go together and rate-of-climb indicators and thrust levers go together. To the experienced jet transport pilot, it will be obvious that this is an oversimplification and many might argue that such an oversimplification has no merit. However, this energy management concept is not new and is part of a total concept for instrument flying promoted years ago by the Air Force. The success of that program established that a pilot had fewer problems in accomplishing his energy management task under this concept.

To avoid criticism for gross oversimplification
using the latter concept, it must be remembered that
changes are made for the purpose of changing the r
climb or the vertical direction (angle) of the flight
A *temporary* elevator deflection is necessary on je
craft to change the direction of the flight path. On t
propeller types, some of this small change in fligh
came about automatically as a result of the change
wing lift behind the propeller slip stream. The rel
ship between flight path angle and thrust change i
cussed quantitatively in a later paragraph.

The question now arises as to what the differe
between the two concepts if they both require eleva
control the rate of climb. Is the difference just o
semantics? In Boeing's opinion, the difference is th
adoption of the latter concept will tend to force a p
be more conscious of rate of departure from the
slope, or rate of climb or descent. *He will be mot*
to check more frequently on all instruments on his
Being more conscious of rate information availabl
the glide slope, altimeters, and rate-of-climb indi
and how the rates can be controlled by thrust, he wil
quickly assess the true state of the environment in
the aircraft is flying.

MANEUVER MARGINS

Note in Figure 1 that the stick-shaker speed and t
stalling speed are indicated along the airspeed axi
drag curves and the rate-of-climb curves have no
carried any lower than the stick-shaker speed becau
curate information is lacking for lower speeds. N
formance information is required for operations at
speeds, and as a consequence, data collection in the
speed region has a low priority. However, the r
climb performance does not suddenly go to zero a
shaker speed. It will probably go to zero at some
close to the 1-g stall speed. The 1-g stalling speed
been shown because some recent literature has ques
how much real margin exists for maneuvering wh
ing at stick-shaker initiation speeds. Taking the
shaker speed of about 107 knots and the 1-g stall
of about 95 knots and the ratio of one over the oth
squaring that ratio produces a quantity equal to 1.2
is the load factor that is available for maneuvering
plane discussed in the plots at stick-shaker speeds
load factor corresponds to what would be experienc
turn at a 38° bank angle. The data confirm that a
shaker speeds, it is possible to maneuver up to 38
angle before experiencing a 1-g stall. As that ban
is approached, the airplane will start to shake bec
the initiation of stall buffet. However, the maneu
capability is adequate at stick-shaker initiation spe
normal airline maneuvers.

LE-OF-ATTACK SIDERATIONS

xt, examine the effects of t on rate-of-climb capa- and how airplane attitude climb will vary with the nt of thrust that is used in limb. Figure 2 shows the capability at various thrust ities, such as go-around , 75% thrust, thrust for flight, thrust for a 3° glide at VREF, and idle thrust. shown are lines of constant angle-of-attack and body de. As an overall initial vation, it is interesting e that as thrust decreases, peed at which maximum f climb or minimum rate scent occurs, decreases. neral, this will always be tuation as an airplane be- s performance-limited, because of higher drag or rust.

m the lines of constant of attack, it is obvious e angle of attack does not e much with thrust setting ven speed. At high thrust s and low airspeeds, there e small effect on the angle ck required for 1-g lift. s caused by the lift com- generated by the thrust is directed upward rela- the flight path at high e angles of attack. It is apparent that either angle ck or airspeed can be used ference for flying the airplane during thrust changes. er, since most of the Boeing airplanes are not ed with angle-of-attack indicators, flight procedures nerally written around the use of the airspeed indi- nd the attitude indicator.

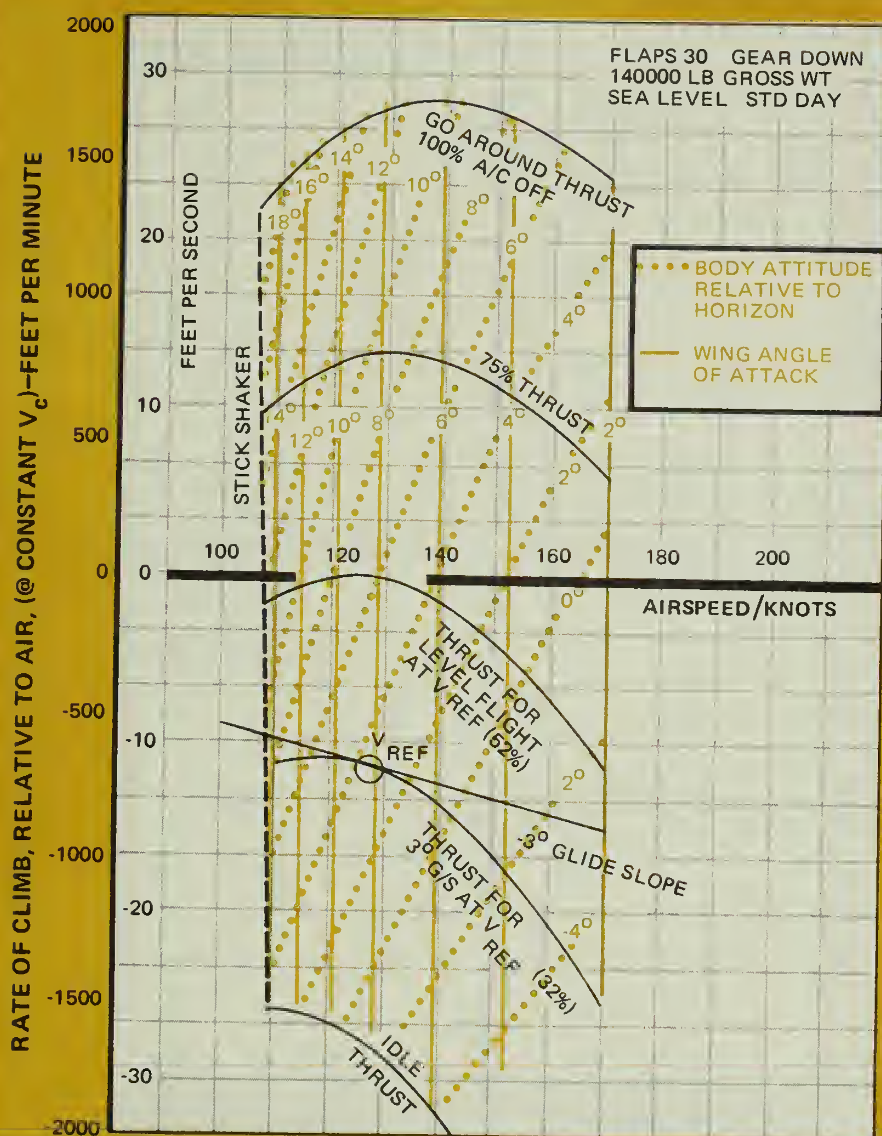


Figure 2. FLAPS 30 RATE OF CLIMB FOR VARYING THRUST SETTINGS

UDE CONSIDERATIONS

also possible to make some interesting observa- om the lines of constant attitude. For instance, if plane is flying on a 3° glide slope at VREF, the e attitude would be in the order of 3.5 degrees. If around is made by adding go-around thrust, and ed is held constant, the airplane attitude would go up to about 14°. If the original attitude of 3.5 is held during and after thrust is applied, it is obvious that the airplane will tend to accelerate and eventually stabilize at a higher speed where the rate of climb will be less than that which would occur if the airspeed had been held constant. The data of this chart show that there is a definite attitude associated with each power setting and with each speed. The data establish the point that if airspeed is held constant during a thrust change, it is necessary to change the attitude to accomplish the intent of changing the thrust if the greatest benefit is going to be realized from the thrust change in terms of rate of climb or rate of descent. If it is desired to attain the rates of climb relative to the air that are shown on this chart, it is necessary to establish the attitudes and the thrust that are shown regardless of whether the airplane is travelling in an upward-moving current of air, a downward-moving

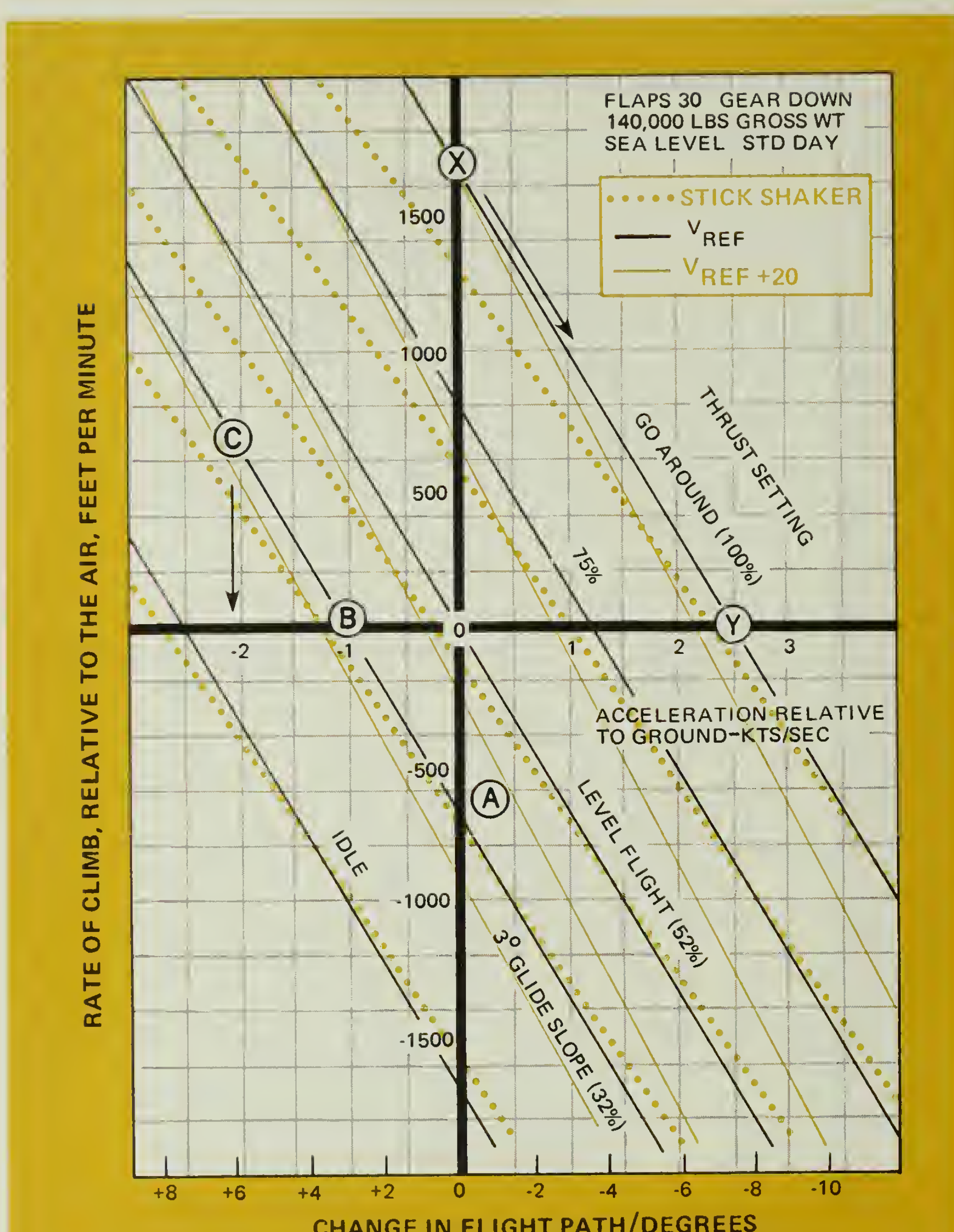


Figure 3. VARIABLE SPEED CLIMB CAPABILITY

WIND SHEAR HAZARDS continued

current, or is flying in still air. These data illustrate why the previous article stated that very high attitudes may be required in order to establish positive rates of climb if a wind shear is encountered that reduces the airpseed to near stick-shaker speeds.

PERFORMANCE EFFE
OF ACCELERATION
ALONG THE FLIGHT

Only the climb capal of the airplane at constant have been discussed s Since an airplane is not flown at constant speed desirable that pilots unde the quantitative effects celeration and decelerati the climb capability of t plane. The effects of a ation of the airplane, *rela the ground,* on climb a scent capabilities of th plane *relative to the a* shown in Figure 3. The fects are presented for typical speeds: stick-s V_{REF}, and 20 knots V_{REF}. The thrust levels same as were shown on 2 where the effects of climb for several thrust were illustrated. A given on any one of these lin dicates what the rate of or rate of descent woul the airplane were stabil the speed, thrust, and a ation selected for the p interest. The values of climb for the zero accel case should be the same a values shown on the pr charts. In other words, zero acceleration repr the constant speed cas constant speed climb cap can be obtained simply b ing at this chart for the zero acceleration case.

At a given power setting and a given airspeed possible to get an acceleration of the airplane o changing the flight path, so there is a direct relati between the acceleration that is shown on the hor axis and the change in path required to obtain a acceleration. That change in path for a given accel is shown on a scale at the bottom of the chart. Thi is significant in that it helps the pilot to unde what the energy trades are in flying an airplane. stance, if the airplane were on a 3° glide slope at stant speed and a rate of descent of about 680 with the thrust required to maintain the 3° glide (A), the airplane could be leveled off to a hor flight path (zero rate of climb) and the airplane

rience a deceleration of
oximately 1 kt/sec (B). By
3° change in the flight
the airplane attains a de-
ation of 1 kt/sec. The flight
could have been further
ged another 3° and the
ane would have a rate of
of about 680 ft/min (C).
on this new flight path,
irplane would be deceler-
at the rate of approximate-
t/sec. An understanding
s chart helps the pilot to
e that he has a very power-
y of augmenting the climb
rmance, if necessary,
ut having to make a thrust
e. That is particularly
tant at a time when there
more thrust to add.

other significant point to
de from the use of this
is to show the effect of
to accelerate the airplane
to the original airspeed
having encountered wind
hat reduces airspeed. For
e, assume that the air-
is established in a climb
maximum thrust at con-
rspeed where it has about
ft/min rate of climb (X)
en encounters a wind
hat reduces airspeed 20
If the pilot reduces the
path down to the point
an acceleration of 2.5
occurs, (Y) the climb
ity will be cancelled out
tely, Zero rate of climb
exist under such conditions. Under these circum-
, it would take eight seconds to recover the original
d. This situation wouldn't be particularly bad
t the same time a downdraft of 20 ft/sec was also
ered. The airplane would then lose 160 feet of
in the downdraft while it was accelerating back
riginal airspeed. Now if the aircraft were relatively
the ground or to some high obstacles when this
d, the altitude loss could be critical.

ilar example can be given for the approach case.
that the aircraft is stabilized on a 3° glide slope,
/min and simultaneously encounters a wind shear
uces the air speed 20 knots and a downdraft of
ft/sec. If the pilot tries to accelerate the airplane
adding thrust, i.e., by putting the nose down an

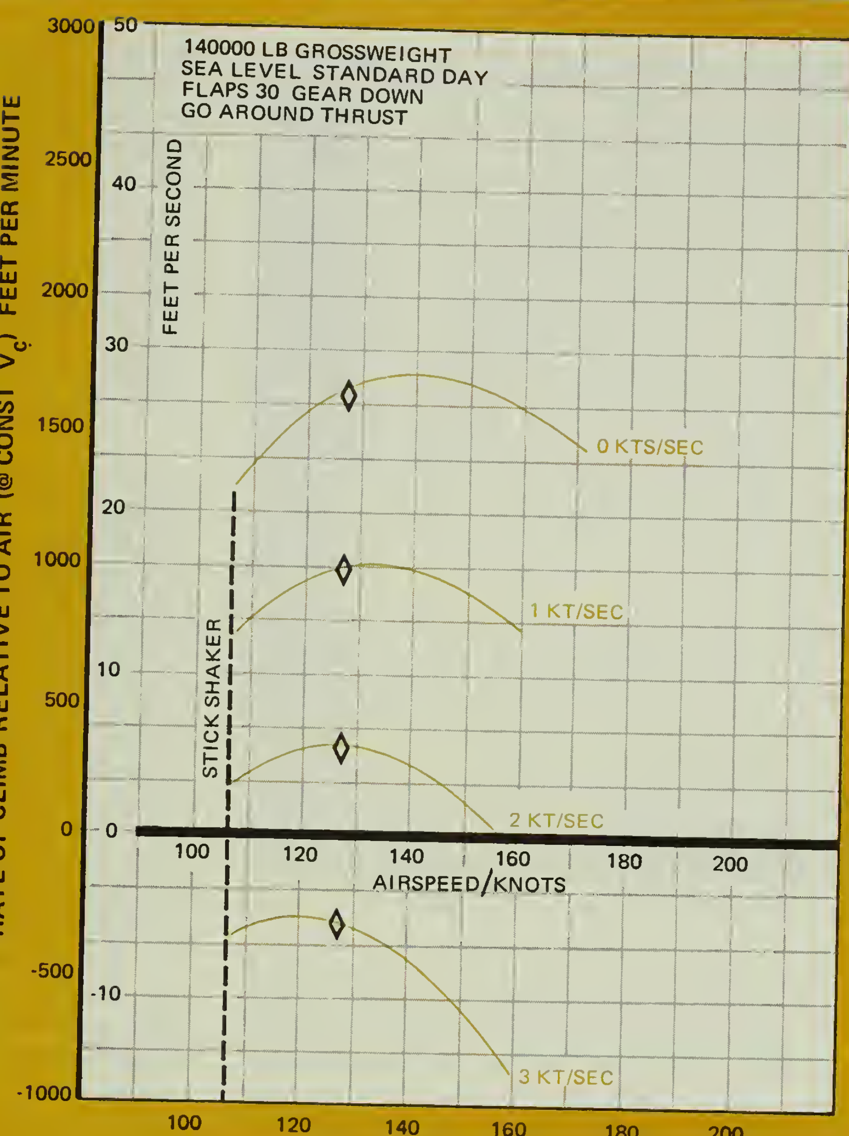


Figure 4. EFFECT OF ACCELERATION TO COMPENSATE FOR WIND SHEAR

increment of about 3°, where it is possible to get an acceleration of 1 kt/sec, it would take 20 seconds to regain the original speed. During that 20 seconds the aircraft would fall 600 feet below the 3° glide slope due to the downdraft and the acceleration.

There are those who will say that no sane pilot would fly that way, but the examination of flight records has revealed instances where it is obvious that the aircraft was indeed going down a 3° glide slope with the thrust idle and a deceleration of 1.5 kt/sec. Figure 3 shows that this is possible, but fortunately the airplanes did not encounter any wind shear and apparently the pilots did manage to get the thrust back up again prior to the time of landing flare. However, if those aircraft had encountered a wind shear of the nature just discussed, they also would

have crashed, as some other airplanes are known to have done, if the attitude had been lowered to gain speed while the engines were coming up from idle thrust.

Figure 3 is also valid for determining the deceleration available while bleeding-off airspeed along a fixed glide path at a particular thrust setting.

The impact of acceleration is also shown in Figure 4, which again is a rate of climb versus airspeed plot for different levels of acceleration. This is for a 140,000 lb. gross weight airplane on a sea level standard day with go-around thrust and with the air conditioning turned off. The data are shown from stick-shaker speeds upward to essentially flap placard speeds. This illustrates for the flaps 30° case what will happen to the rate of climb if the airplane is accelerated at various rates, such as 1 kt/sec, 2 kt/sec, etc.

Assume that the airplane is flying at V_{REF}, which is indicated by the diamonds on the plot, at about 128 knots, and that a wind shear is encountered that reduces the airspeed to stick-shaker speed. Assume, for this illustration, that engines are at go-around thrust and that the airplane has been stabilized at the rate of climb which corresponds to 128 knots. Also assume for the illustration that the pilot had become aware that the airspeed was decreasing and that he was increasing the angle of attack of the airplane so as to hold 1-g flight. It is apparent that, should it happen, the rate-of-climb capability would decrease from about 1650 ft/min. to 1320 ft/min. This means that it would be possible to maintain level flight in a downdraft of around 22 ft/sec. downdraft at about the time it reaches stick-shaker speed. What course of action should be taken? Should the aircraft be accelerated back to the original airspeed? It is obvious that if it is accelerated too rapidly, at anything more than 0.5 kt/sec., it would start to lose altitude. At that rate of acceleration, 40 seconds would be required to regain speed. The point illustrated here is that there may be times, such as in this example, when a pilot has no choice. He has to fly, at whatever reduced speed results from a wind shear encounter, until a time comes when it is possible to accelerate without loss of altitude. In this case, if the pilot is close to the ground or some nearby obstacles, he simply cannot afford to accelerate the aircraft at a very high rate at the expense of losing altitude. This is one of the major points that Boeing was trying to emphasize in the original article.

The point is still valid even if higher speeds are being carried. For instance, assume that the pilot has been making his climb at 148 knots, i.e., a maximum 20 knots above V_{REF}, as presently recommended, and encounters the same speed-reducing wind shear of 20 knots. The twenty-knot shear would reduce his airspeed to 128 knots. He would still be in the region of maximum rate-of-climb capability and he could accelerate again at about 0.5 kt/sec. and fly level in a downdraft of 22 f
The downdrafts that were experienced in an accid
New York (JFK) in 1975 are believed to have be
this order of magnitude.

The same principles apply no matter what spe
being carried. Don't accelerate so rapidly that the d
flight path cannot be maintained in the presence of a
draft. The point should be made that, if the airspee
reduced to stick-shaker speed, it could be very detrin
to put the nose of the airplane down in order to acce
rapidly back to the original speed. Such action ma
produce the desired results.

PERFORMANCE EFFECTS DURING FLAP RETRACTION

Climb performance improves as the flaps are ret
from the landing configuration at Flaps 30 or 40
go-around setting at Flaps 25 or 15. Consequently
wind shear is encountered when the aircraft is in the
ing configuration, it may be advantageous to retra
flaps to 25 or 15. However, if the flap retraction is
in a manner which allows the aircraft to accelerat
benefit of improved climb capability at the selecte
setting may not be attained. The impact on accele
and rate of climb using attitude, angle of attack,
speed as a reference during flap retraction are consi
in the following discussion.

a. Using Attitude Reference

Rate-of-climb capability is shown in Figure
flaps 40 – gear down, flaps 30 – gear down, flaps
gear up, and flaps 15 – gear up. The location of
for flaps 40 and flaps 30, V_2 for flaps 25 and fla
and the 1-g stall speed for flaps 15, 25, 30 and 40
been shown for reference purposes.

Figure 5 will be used to emphasize points about
of attack, airplane attitude, and flap retraction
wind shear encounters. If the airplane were on a 3°
slope at 30° of flaps, the body attitude would be
3.4° nose up at V_{REF} speed (A). Figure 5 shows
go-around is initiated using go-around thrust, and
is held constant at V_{REF}, the attitude must be ch
to 14° (B).

This is quite a change, but nevertheless, not a
usually high attitude. Figure 5 also shows that
attitude is held constant at 14° and flaps are ret
from 30 to 25, the airplane will accelerate to abou
knots (C) before stabilizing. If flaps are further re
to 15 at that same 14° attitude, the airplane will acce
to 170 knots (D) before stabilizing. All of those
are reasonable for the flap positions selected. In
the 14° attitude will take the airplane to maximum
of-climb speed at flaps 15 – gear up. Now holding
stant attitude will, as previously stated, program
acceleration. Based upon the previous discussion or

fects of acceleration are, the intended purpose of ving perfromance by retracting flaps could be de- since any acceleration could certainly result in tting the full benefit of the constant-speed climb lity that goes along with the particular flap position d been selected.

data show that it is possible to maintain a constant climb in a downdraft of 28ft/sec., but if too much ation is allowed during the retraction period, and no way to limit the acceleration if the attitude is nstant at 14°, the airplane will not climb at as high s existed at the original climb speed that went along ps 30 at VREF.

efore, it is not clearly black or white whether hould be partially retracted under all conditions vind shear is encountered; any benefit would de- n the procedure used. It is obvious, however, that the flap retraction, it is possible to go to a higher titude, even up to 18°, if a 15° flap position is l. This results in less acceleration during the flap on period, and it might be that under such circum- that flap retraction would be beneficial. At least ime when a stabilized speed was reached at the ude, the rate-of-climb capability will be 40 ft/sec. to the air. This is adequate to overcome most afts experienced to date in regions within approxi- 400 ft of the ground. The discussion above further iates the reasons for the emphasis on high attitudes revious *Airliner* article.

nsideration of the discussions, it should be em- l that the airplane attitudes shown in these charts d for stabilized 1-g flight conditions at constant d airspeed for the airplane weight shown. If ake use of any of the specific attitudes from these s a guide for operations of a 727, those attitudes e treated only as initial targets. Flight in severe ear is a dynamic or constantly changing situation firmation that any given attitude is adequate for en situation comes from instrument readings ow that the aircraft is responding in a satisfactory rable manner.

ing Angle of Attack

e question "Why all of this emphasis on atti- en what we really need is an angle-of-attack ?" has been asked many times. Most airliners ave angle-of-attack indicators but they do have ificial horizons' that is why attitude has been zed. However, by using Figure 5, it is possible ate the angle-of-attack situation when flying onditions just discussed. It can be seen that the attack that goes along with VREF at flaps 30, 8.4°. Obviously, then, there wouldn't be any e in angle of attack flying on a 3° glide slope er maximum go-around thrust had been applied.

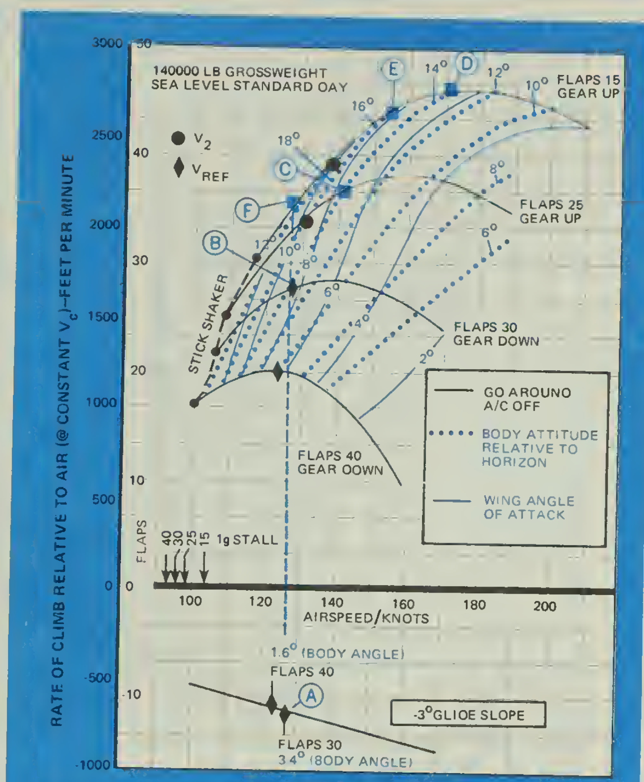


Figure 5. CLIMB CAPABILITY AT CONSTANT AIRSPEED

Now consider what would happen if flaps were reduced while the angle of attack was held constant. If this were done, an acceleration would occur as flaps were partially retracted. The airplane would accelerate much in the same manner as when holding constant attitude; however, the final stabilized airspeed (E) would not be as great, so the reduction in climb capability during the acceleration period would not be as great as for the constant-attitude case previously discussed.

c. Using Airspeed Reference

As a better alternative, it is possible to increase the angle of attack to 11° (F) and hold speed constant during flap retraction. If the speed is held constant, it is possible to realize the benefits of the increased rate of climb resulting from the reduction of drag during the complete flap retraction period. The same thing could be done through the attitude indicator by increasing the attitude from about 16° to 20°. Speed could be held constant during flap retraction to 15 degrees without encountering stick-shaker for the flaps 15 – gear up case. The constant-speed technique would be the most simple method of attaining the rate-of-climb improvement from the use of the lower flaps 15 position. However, this would result in flying on the back side of the drag curve for the flaps 15 case. As can be seen from this discussion, there is merit

continued on page 29

CHAIN TO

Major Kenneth S. Harvell
20th Bomb Squadron, Carswell AFB, TX

It all happens one step at a time. In reading mishap reports, one can almost hear the links of the death chain clank together. That's what happened several years ago to a B-52G crew.

They had flown a normal training mission which included a taxi-back landing to pick up a standboard IP to complete a check ride for the copilot. During the second takeoff, shortly after passing 70 knots, the aircraft veered sharply to the right and departed the runway. The departure angle and sideslip increased, and the main gear became airborne leaving only the right tip gear on the ground. The tip gear failed and the right external tank contacted the ground and ruptured resulting in the initial explosion and fire. Progressive structural failure, fire and explosions ensued as the aircraft came to rest in a ninety degree sideslip.

All crew members except the pilot perished in the wreckage. The pilot survived for several hours after the mishap, but died from the burns he received.

You have all seen the mishap chain that depicts a sequence of events that lead up to a mishap. If one link is broken, the mishap is averted. The links in this mishap chain were very pronounced.

The B-52G fuel management procedures call for the engine crossfeed manifold valves to be opened when fuel in the main tanks drops to specific levels. The G model main tank gauges are marked with a green band to indicate this level, and the Dash One and checklist specify that the engine crossfeed valves, for this airplane

**Chain of events that led to this
Breaking one link would have prev
mishap.**

EATH

mbered 9, 10, 11, and 12 should open. In this case, however, THE PILOT FAILED TO OPEN THE OSSFEED VALVES.

By failing to open the crossfeed ves, specifically number 12, the y source of fuel for engines 7 and vas the fuel in number four main k. There was still sufficient fuel he tank for full engine operation ll systems were operating mally. Unfortunately, this was the case. There are four boost nps in each of the B-52G's main ks with one of the pumps located he sump. In main tank four, st pump 19 was in the sump. MP 19 WAS INOPERATIVE.

As the aircraft accelerated for eoff, the fuel shifted aft covering y pump 19. Without an alternate rce of fuel provided through the ssfeed valves, air was drawn into ines 7 and 8 and they flamed out. The aircraft was below the minimum speed for directional control, so departure from the runway was inevitable.

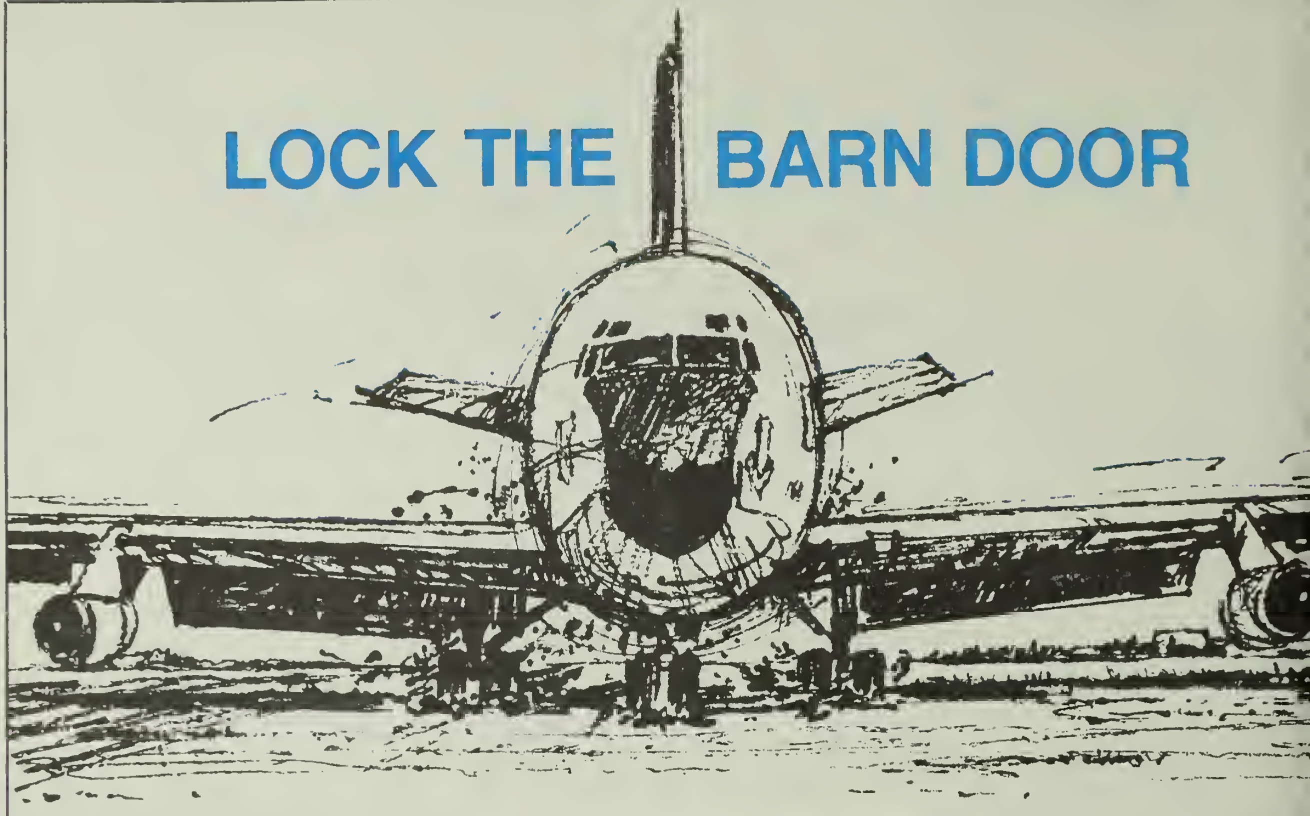
Back to the mishap chain of events. The mishap was caused by a combination of crew error and materiel failure. Notice I did not say copilot error. The crew error link in the chain can be expanded to three links. First, the copilot did not set the fuel panel in accordance with the Dash One amplified directions. Second, the pilot did not cross-check the fuel panel as he was supposed to do, and third, the evaluator also failed to check the fuel settings. All should have seen this discrepancy. An operative number 19 boost pump, the fourth link in the chain, could have compensated for the three pilots'mistakes.

Like so many aircraft mishaps, the crew error was not a failure to respond to a multiple emergency under adverse conditions; it was a simple failure to accomplish a routine checklist item that proved to be the critical difference between life and death.

As a result of this mishap, the B-52G Dash One was changed to specifically require the pilot to cross-check the copilot's actions in setting the fuel panel, but checklists cannot be expanded for every contingency. They would be far too cumbersome.

The responsibility for systems knowledge and the proper use of tech data lies with us as crew members. If we don't follow the guidance learned from the experience of others, we may not be fortunate enough to feel the weight of the chain in time to break free. ★

LOCK THE BARN DOOR



We are all very good at locking the barn door behind the cow. (Never did figure out whether that cow was going in or out). Here is an example, but in this mishap, the actions to prevent the cow's movements reflect some positive thinking from which we can learn.

A KC-135 was preflighted since it was to be a spare. It wasn't needed, however, so the pitot covers, tail stand and engine inlet covers were installed. Next morning the aircraft was on the schedule, but since less than 24 hours was to elapse before flight, a maintenance preflight was not required. When the flight mechanic arrived at the aircraft, he loaded some equipment and ran his preflight checklist. It was dark and raining so he returned to the crew operations building to complete his paperwork.

Finally the crew assembled at the aircraft, made the checklist inspections and started engines. When they were ready to taxi, the ground crew acknowledged with the standard phrase, "pitot covers removed."

It was still raining when the aircraft started rolling for takeoff and the AC adjusted the wiper knob setting in an effort to increase visibility. Then he noticed that both airspeed indicators were indicating 55-60 knots, although engine power and acceleration appeared normal. Ahah! Something wrong with the airspeed indication. Abort!

With 8,000 feet of runway remaining, the aircraft started eating it at a prodigious rate – seeming not to be responding to brakes, speed brakes and power reduction. When it became apparent that the aircraft would not stop on the runway and, in fact, would cross a busy highway, the AC decided to turn. The aircraft turned, left the runway and plowed up some 300 feet of mud and grass. Damage was in the $21,000 area.

Okay, so this story is practically a re-run of hundreds almost like it. We haven't prevented them yet, so how are we going to do it now? Here's how this unit responded.

- The pitot covers were standard – dark red made darker by dirt and grease – streamers likewise and hard to see. Now they are international orange with longer streamers.
- A red cross when a work card item has to be reaccomplished prio to flight whenever the aircraft is preflighted but not immediately flown.
- A call out by the pilot at 90 knots to provide a positive crosscheck.
- Flight mechanic must report t pilot that "six ground safety locks and pitot covers stowed."

This won't be the last of aircraft attempting takeoff with pitot covers or control locks installed. But the positive measures listed above mig help your outfit avoid such a mishap. ★

NEWS FOR CREWS

-formation and tips to help your career from the folks at Air Force Military Personnel Center, Randolph AFB, TX.

Major Bob Casey
Rated Officer Career Management Branch • Air Force Manpower and Personnel Center

TED OFFICER CROSS FLOW

ated Crossflow is a subject receiving increasing attention through the USAF rated force. As used here, rated crossflow means pilots or navigators ging major weapons systems and/or major weapon m group (e.g., going from B-52s in the Bomber p to F-4s in the Tactical Fighter Group). Most of re aware of some current crossflow opportunities – ange programs, ATC instructor duty, and others – vould like to see even greater opportunity. Because ontinuing interest at all levels is based on the belief crossflow, specifically increased crossflow, would it both the individual and the Air Force, it is certain- orth discussion. To balance the discussion, though, ave to look at both the benefits and the constraints chieving those benefits. Finally, we can look at at's happening now." First the benefits.

rhaps the biggest benefit of increased rated crossflow rtunity is happier aircrews. That alone makes the PC resource managers' job easier, so we like it off the top. At the same time, though only one vari- affecting retention, if crossflow makes aircrews hap- a seemingly direct payoff of increased crossflow d be improved retention. ("Seemingly" is used be- the impact on retention depends on the amount of ased crossflow – a small "rich-get-richer" program ome could produce backlash.) Any improvement, ver, will increase total force capabilities. Another f is that increased crossflow helps the overseas im- ce problem. We could fill the overseas fighter jobs ently about 60% of the total fighter requirement) a wider pool by using pilots and navs crossflowed other weapon systems. Finally, increased crossflow promote better future leadership. Captains and s moved between weapon systems today will pro- a larger base of officers with broadened experience 1980s and 1990s. So far, crossflow looks good.

there are constraints that now prevent opening the low gates, and the constraints are all heavy hitters: nit experience levels, new pilot absorption, the readi- nplications of both factors, and training costs. These onstraints far different from the environment of east Asia days, when an overall goal was to satisfy neral policy of no involuntary second combat tours. constraints are not designed to "lock aircrews into original weapons system and prevent crossflow." Instead, a combination of ops, personnel, and budgetary factors are the basis for the conscious, collective (Air Staff and MAJCOM) decisions which dictate the assignment actions affecting you. The guidance calls for allocating new inputs and managing available aircrews to (1) satisfy the need for experienced aircrews, (2) build the rated inventory towards total active force requirements, (3) maintain no less than established minimum experience levels in operational units, and (4) do it all with minimum training resources. The fact that crossflow – by definition – commits us to double training any individual crossflowed, is an obvious problem made worse by the prevailing desire to crossflow to fighters, the most expensive system from a training standpoint. But an even bigger impact is the experience/absorption problem. Even without crossflow, in the early 80s, we will be absorbing double our current rate of UPTs and maintaining MAJCOM-established minimum unit experience levels will be even tougher than it is now. Crossflow aggravates the problem in two ways – by putting a further drain on our already limited training resources, and by moving experienced officers from one system and making them "inexperienced" in the new system. Finally, sizeable crossflow can generate a middle management problem. Those crossflowed would enter the squadrons with appropriate rank for flight commander or other supervisory positions, but without the weapon system experience to provide that supervision.

Despite the foregoing, crossflow opportunities definitely exist for those rated officers (principally pilots) who are interested in going – temporarily or permanently – where the Air Force requirements are, and whose major weapon system can best withstand their loss. During the last year, 456 pilots crossflowed from one major weapon system to another, for a variety of reasons: To systems requiring high experience (C-5, FB-111, U-2, SR-71); to alleviate "closed system" problems (F-106 to F-15, RF-4 to F-4); to convert helo pilots to fixed-wing systems; as part of inter-MAJCOM exchange programs; for ATC IP duty; and to provide current weapon system experience for individuals with outdated weapon system experience (C-7, C-123, C-119). While these examples may not fit into your personal definition of crossflow, they do satisfy individual desires to fly another aircraft and simultaneously meet Air Force requirements. For its obvious contribution to the career intent and development of our aircrews, we strongly support crossflow. All

continued on page 26

Mail & Miscellaneous

Send your ideas, comments, and q est o
Editor, Aerospace Magazine
Norton, AFB, CA 92409

TERMINATION OF EMERGENCIES

A recent occurrence at Eglin AFB brought to light a situational dilemma during an inflight emergency which I feel may be of interest to other flying units. It is not necessary to expound the situation in its entirety but briefly the following occurred.

After declaring an emergency for an onboard electrical fire, the aircraft commander determined to his satisfaction that the fire was extinguished and requested taxi to parking. At the same time he attempted to cancel the emergency with the tower.

The base fire chief, who had responded to the emergency, felt that further inspection by qualified crash personnel was necessary and would not allow the emergency to be terminated. During the ensuing moments, quite a bit of confusion resulted as the fire chief attempted to get the crew to shutdown and the crew attempted to taxi back!

Air Force Regulation 92-1, paragraph 4-8a, specifies ". . . the senior fire department supervisor on the scene decides when to terminate the emergency. . . ." At the same time it is realized that the aircraft commander is ultimately responsible for both his crew and aircraft. The solution obviously lies somewhere in between for most occurrences and in most situations. What we don't want to neglect is that everyone involved has the same goals; that being the protection of life and property. For any given emergency situation there exists a delicate balance of teamwork between aircrew and crash personnel, complicated by a lack of direct communication from one to the other.

It's obvious that there is enough inherent complication without the added misunderstanding of who can or will cancel the emergency. To that extent, we at Eglin have encouraged cross-talk on this subject between aircrews and the fire department. This is usually accomplished at an appropriate aircrew meeting or flying safety meeting. It allows the fire department personnel to explain their vested interests and why they may choose to hold an emergency open contrary to the wishes of the aircrew.

This has proven to be a fairly simple and painless process for everyone involved. It fits well on the agenda of most any flying safety meeting. Hopefully, it will help eliminate a misunderstanding at a later date when time and teamwork may be the crucial element!

JOHN R. WITTMEYER, Capt, USAF
Flight Safety Officer
Armament Development and Test Center
Eglin AFB, FL

NEW LESSONS LEARNED SHOW

It's new show time again! The safety people here at the Center have just completed a 35mm slide/tape show titled "Aircrew Coordination," another of the Lessons Learned series. It should be available for distribution in late March.

This 19-minute show discusses five phases of flight — takeoff and climbout, rendezvous/air refueling, low level, cruise, and approach. In each phase of flight an actual mishap is reviewed from the standpoint of systems knowledge, situation awareness and crew coordination. Of course, we had 20/20 hindsight and could see exactly how the mishap could have been averted. By viewing this show you, the crew member, can gain some valuable lessons learned and increase your chances of survival.

To get this slide/tape show, free of charge, have your film library order AVR 195, crew Coordination." Don't get to bring the popcorn.

FAA TAKEOFF PROCEDURE

A two-segment takeoff pr for jet aircraft designed to airport noise levels has been mended by the FAA for use ators of large jets.

Aircraft using the new t ment procedure will climb u power to 1,000 feet, then redu angle to pick up speed anc retraction of flaps and other devices before continuing 3,000 feet under reduced They can then follow a nor parture procedure.

The agency did not make cedures mandatory becaus will be times when the pi need to disregard them fo considerations.

NEWS FOR CREWS from pa

of us have to recognize that the s crossflow program must be consi readiness and resource constr "heavy hitters" mentioned earlier. less, senior USAF leadership is we your interest in crossflow and we c seek expansion of opportunities in tion.

As a last thought to brighten you for varied rated experience we'd li out that diverse job opportunities volving flying a new airplane — ex nearly every major weapon system g airplanes or new models, varied mi structor or other specialized aircr they're all there, and most fliers ar to discover the scope of assignment to them. Give us a call.

ABOUT THE AUTHOR

Major Bob Casey is chief of the tribution and Training Managemen Analysis Section at AFMPC. He is of the University of Wisconsin. His have included duty on the Air Sta and Analysis), and as an F-4 Instru

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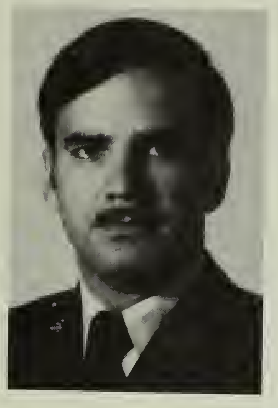

CAPTAIN
Billy S. Schricker

TSGT
Paul G. Hannel

16th Tactical Airlift Training Squadron
Little Rock Air Force Base, Arkansas

CAPTAIN
John L. Carkeet
16th Special Operations Squadron
Hurlburt Air Force Station, Florida

On 7 March 1978 during a C-130E Phase I training sortie, Captain Schricker, Captain Carkeet (Phase I student), and Sergeant Hannel, were at 15,000 feet when the control column suddently pitched full forward and the aircraft went into a very steep dive. Runaway trim procedures and full electrical isolation of the trim system had no affect on elevator operation. Using physical force, the pilots overcame the extreme control pressures and returned the aircraft to level flight. Almost immediately, the control column went full aft. Again they overcame the control pressures and leveled the aircraft. During the ensuing period of stable flight, Sergeant Hannel made a visual check of the elevator actuator and found no discrepancies. Then without warning, the control column again went full forward. The utility and booster system hydraulic boost packs were individually turned off and on without discernible effect. Captain Schricker then directed all hydraulic assistance removed from the elevator and electrical power restored to the trim system. Physical force, with trim assistance, returned the aircraft to level flight. During the uncommanded pitch changes, the altitude varied between 12,000 and 18,000 feet MSL with vertical velocities of plus/minus 6,000 fpm. An emergency was declared. A controllability check revealed that the aircraft could be landed so at 2,000 feet MSL another controllability check was performed and the crew elected to fly the approach with zero flaps at 140 to 150 KIAS, with the pilots manually overriding the extreme air-loads on the elevator and the engineer adjusting power to control airspeed and the rate of climb/descent. Three miles out on final approach, a wind shear caused the airspeed to suddenly decrease 20 KIAS resulting in an immediate nose-down attitude. The pilots were physically unable to recover from the dive, but Sergeant Hannel applied full power, causing the nose of the aircraft to rise enough to recover. As they climbed through 300 feet AGL, 2.5 miles from the runway, the engineer slowly retarded the throttles to decrease the now high airspeed and pitch attitude. At the runway threshold, the airspeed suddenly decreased and the nose pitched down again. Full power was reapplied. Just after the nose passed through level flight, the aircraft contacted the runway in a nose-high attitude and with a descent rate of approximately 1500 fpm. The landing roll was completed without further incident. Post-flight inspection of the aircraft revealed only minor damage to the tailskid. Skill, knowledge of aircraft systems and procedures and exceptional crew coordination saved a valuable aircraft and lives. WELL DONE! ★

LETTERS TO REX

I've been in one form of aircraft operations or another for almost 25 years and am about to retire. During that quarter century I've seen the transient aircrew problem from both sides of the windscreen. There is no pat answer, but I'd like to pass on my feelings and observations.

Some years ago, a young operations NCO and his equally young operations officer made a concentrated effort to get the Rex Riley Transient Services Award. They coordinated with local motel owners for reduced room rates. They contacted the Chamber of Commerce and prepared maps, tourist information, and other handouts. They developed Transient Aircrew Questionnaires and the base commander got involved when services were below par. At last they felt their program was ready for Rex Riley.

One Friday evening at about 1730 local, Rex and his saberliner came whipping in. From touchdown to wheels up, things went astray. First TA parked Rex on taxiway 42 when four spots in front of Base Ops were vacant and nobody inbound. The motor pool driver, who was a new guy, went out to the wrong T-39. Inside Base Ops, the coke machine kept Rex's quarter but didn't give up a coke. Rex asked to go to the BOQ but had to wait for transportation since the first car had gone back to the motor pool. When Rex got to the BOQ, he asked to see a typical room that a transient crew might be billeted in. The room he saw had not been made up and the window air conditioner was not only running full blast but had also leaked a large puddle of water onto the rug. Finally, the Officer's Club gave him a rough time about eating dinner while wearing his flight suit. Needless to say, Rex didn't recommend that particular installation. The events that happened above are not unique. Transient crews frequently get lost in the shuffle when a base allows the system to take over and fails to put forth the personal efforts that are essential to a good transient services program. In the security of our own little worlds, it is easy to forget that many aircrews spend much of their lives living in transient facilities, dragging bags around the world or eating out of vending machines. While it is not necessary to lead transients around by the hand, it is important that when a crew member crawls back into his machine, he is not upset because he couldn't eat, had to walk in the rain or slept in a room where the th
stat was stuck on 95 degrees. Air Force ai
have enough concerns flying those million dol
planes. Let's don't let them down through a
concern or poor attitude while they are on the g

One Who's Ca

Many aviators frequently get confused w
base is designated PPR (Prior Permission Re
or OBO (Official Business Only). PPR indicat
an airfield is closed to transient military aircr
less prior permission is obtained from the bas
cerned. The purpose of PPR is not to prohib
sients but rather to sequence and control traffi
must be obtained before departing to a PPR
OBO is another matter. An airfield designated a
cannot be used by transient aircraft to obtain
ance, servicing or other items pertinent to it
operations. The pilot (or passenger) must be
cial business. Written orders, including flight
or prior written notification that state the purp
the visit, at or near the base concerned, is a
to use a base designated as OBO.

The above rules are established so that
field manager can assist the transient, not
him. The airfield wouldn't be designated OBO
unless there was a reason, i.e., no parking,
servicing, exercises, etc. Before a base
designated as PPR for more than one day, a
must be obtained from the appropriate majo
mand. Of course there are exceptions. Spe
mission aircraft carrying VIP code 6 or hig
exempt. Also these restrictions do not prev
use of a base by a military aircraft in an eme
or as an alternate for IFR flights. But don't ab
exception for an emergency. Case in point: An
was on the west coast flight planning when
covered that one of his key refueling stops wa
He called the Base Ops concerned and was
the dispatcher that they couldn't handle him
he called the Airfield Manager—same answer.
he called the Chief Ops and Training—no
launched out of his west coast TDY base an
he got near the OBO base he declared an eme
and landed. He was met by the base comman

cted transient maintenance to make a complete ection of the aircraft. They found no problems. pilot finally admitted maybe he really didn't have emergency but if he didn't get home soon "his was going to kill him." A violation was filed nst the individual with copies being forwarded to Air Force IG and the pilot's MAJCOM head- ters. PPR and OBO: Don't leave home without it!

Concerned

Concerned,
anks! A good review!

---

rive the back seat of a white rocket most of the and in the 8 years or so that I've been riding nd UPT studs, I haven't seen much change in ld attitudes until recently.

last two cross-country excursions produced eable service and attitude changes at three s where we usually scratch and claw for info or tance. On the walls of all three bases were brand- Rex Riley certificates, mounted and displayed dly. One ops counter had new printed info sheets rcrews which carried the headline "__________ orce Base has just received the Rex Riley Tran- Services Award. We are proud to have the award firmly believe that aircrew service is our only ess. If we can assist you in any way, please It sure is great to drag a tired bod out of a ine and be met by folks who care.

think you're headed in the right direction. Keep e good work!

Appreciative IP

Appreciative,
inks for the positive strokes! We know what nean and hope we've made some headway!

---

er seeing message traffic concerning some TA who either caused or contributed to an incident/ ap, we wondered what the Rex policy is toward ort of thing. That has to be a pretty positive and urable indication of aircraft servicing capability.

TA Foreman

TA Foreman,
od point! Our OI says that a base will be re- d from the Rex list when "Transient Alert Per- el cause a mishap or allow a safety of flight mis- em to go uncorrected." We currently have two d occurrences under investigation in our files. on't want to go half-cocked with a sharp knife tart slashing bases from the list. On the other if we come up with conclusive negligence, we o some administrative surgery to remove the Thanks for the inquiry! ★

WIND SHEAR HAZARDS continued from page 21

to reducing the flap position if the pilot is willing to go to the high attitudes or higher angles of attack necessary to realize the benefits, and holding constant speed is the simplest way to realize the full benefit. Otherwise, it might be better to stay at the original flap position until the hazard has disappeared. Also, it can be concluded from the above discussion that using speed as a reference is just as good as, possibly better than, angle of attack, and a new instrument is not necessarily required.

The *Boeing Airliner* article of January 1977, entitled "Hazards of Landing Approaches and Takeoffs in a Wind Shear Environment" recommended operational techniques to be considered by pilots whose aircraft may inadvertently be caught in a severe wind shear and/or downdraft. The key points of those recommendations have been reviewed and the concepts behind them discussed.

- When forced to fly at speeds near stick-shaker because of wind shears, good climb performance and maneuver margins still exist. Rapidly accelerating the aircraft away from stick-shaker could result in a significant loss of altitude.
- High attitudes are required at stick-shaker speeds and go-around thrust to attain the maximum climb capability of the aircraft.
- Rapidly accelerating to maintain V_{REF} or V_2 airspeeds during a wind shear will severely reduce climb capability. Conversely, decelerating to stick-shaker speeds can provide added climb capability to compensate for large downdrafts.

ABOUT THE AUTHORS

Paul R. Higgins is Technology Chief for 707, 727, and 737 Production Programs for the Boeing Commercial Airplane Company. Higgins, a graduate of Oregon State University with a BS degree in Mechanical Engineering, has been employed by Boeing since 1944 and has been assigned to the BCAC Technology Staff since 1959. His assignments have included technical support of the Aerodynamics, Structures, Weights, Controls, Systems, Powerplant, Acoustics and Materials and Processes staff to the 707, 727, and 737 engineering design projects.

Donald H. Patterson is a lead engineer in the 707/727/737 Aerodynamics staff at Boeing. He graduated from Pennsylvania State University in 1965 with a degree in Aeronautical Engineering. During his thirteen years in the Aerodynamics staff at Boeing, he has participated in several airplane programs involving wind tunnel and flight testing, certification of new models, and customer support. Recently, he has been actively involved in accident investigations and the assessment of the impact of wind shears on airplane performance. ★

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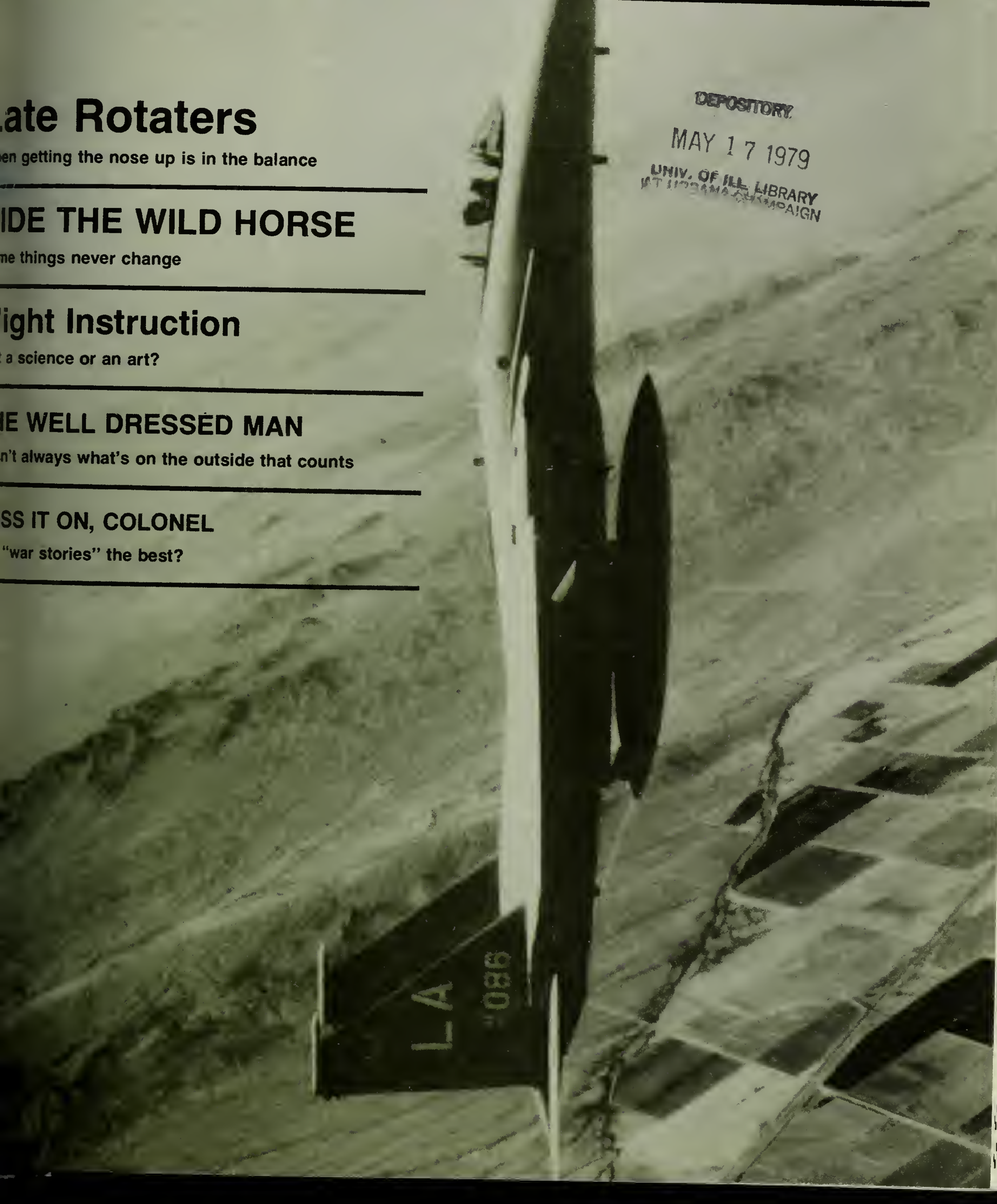

LOW ALTITUDE Single-Ship Mishaps

Captain Eugene Larcom
Directorate of Aerospace Safety

Do you ever fly as pilot or crew member of an aircraft operating alone at low altitude? If you do, this article should provide you with some interesting information.

In 1978 there were 11 aircraft destroyed in the low altitude single-ship environment: three 0-2s, three RF-4s, two OV-10s, two helicopters, and an F-4D. The Inspector General directed a study of these mishaps to determine if there were any common threads. Depending upon your point of view, the results of that study may be quite surprising.

MISSION The 11 mishaps involved aircraft and units that normally fly low and alone.

WEATHER Weather was a factor in three of the mishaps; in the other eight, the weather was great.

PILOT EXPERIENCE Ten of the pilots were captains, one was a first lieutenant. Four of the pilots had less than 1000 hours total, four had more than 1400 hours total. Two had less than 10 hours in the past 30 days, seven had more than 21 hours. Three had less than 120 hours in type (five had 120-500; two had 500-1000; one had 1387).

AIRCREW DISCIPLINE Direct violation of aircrew discipline was a factor in four mishaps—in each case, fatal to the crew members. Three of these mishaps were in relatively uncomplicated airplanes (0-2, OV-10) with low pilot experience in type. The fourth was the only lieutenant in the group. In each case, these pilots intentionally violated the instructions they were given—some even planning in detail their violations.

LOSS OF CONTROL F
these mishaps occurred wh
pilot asked the airplane to d
than it could; the resulting
tures from controlled flight v
such low altitudes that the
no room, nor time, for reco

PRESSING Using the
tion of pressing established
CHANGE PACE study—

". . . a pilot who conti
maneuver or task to the po
known parameters are ex
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decision is normally spont
and made in the interest of r
accomplishment."

We concluded that pressi
involved in 10 of these m
This factor is elusive, but it
of the keys to reducing the
mishap rate, and the larges
factor in low altitude sing
mishaps. Highly motivate
oriented pilots are the com
we need most in time of wa
ing them during training b
they were pressing is a w
such a precious commodity

The common character o
mishaps is that they are al
dies. They involve people w
trained and qualified for t
sions. The missions were
of the ordinary. The pilot
average guys and made th
sort of mistakes that other
pilots made in 1978.

We have said it before
haps don't happen to just t
guy. They happen to pilots
same sort of background,
tion, experience as you,
the same airplanes you d
are not IMMUNE. You may,
be the other guy. Know y
craft. Know thyself! ★

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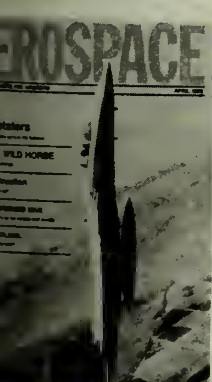

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

FLIGHT INSTRUCTION
Science and Art

John Trobaugh

This discussion of flight
tion will not be limitec
one aircraft model. R
will take a broad view of the
ful concepts of the Instructo
science and art.

We may have made the per
mation takeoff, bomb run, d
barrel-roll attack, crosswind
But do we all understand H
WHY the proper technique
in a perfect maneuver? Mor
tantly, can we all analyze anc
the technique to another pilo
he can perform it, consiste
close to perfection. There a
Great Fighter Pilots; there
Great Fighter Instructor Pilo

Some of the more importa
ties observed in all truly pro
IPs are:

- *Air discipline.*
- A thorough *knowledge*
craft systems and performa
tical phase manuals, weapon
teristics and loading, and lo
cedures.
- An *ability* to *analyze a*
municate the HOW and WH
- *Honesty, unselfishne*
patience.
- A reasonable amount
skill.

You will note that pure p
does not rank at the top of
Many Instructor Pilots, thr
lack of "good hands," m
win a gunnery meet, but thei
will. The apparent contradict
from the fact that those IPs
sate with an abundance of
qualities. They discipline th
and instill this attitude in oth
knowledge is complete thro
tinuous study and effort; the
maneuvers for cues other th
pitch-bank-and-power; they
consider several alternative
communicating these cues t
dent in words that the stud

ıds; they are as honest in admitting r own mistakes as they are in quing those of their students; they unselfish in sharing every bit of r knowledge with the student; they pride in the student's accomplish-ts.

ALITIES

is difficult to rank the attributes ı outstanding IP. I am convinced, ever, that the single most desir-trait is a dedication to air dis-ne.

Discipline,'' by definition, is ining of the mind, body, and l faculties; adherence to authori-elf-control; improving behavior dicious methods.'' It is a healthy de, a willingness to accept sensi-estrictions on the operation of a rful machine, an awareness of erious nature of what is basically y exhilarating profession. It be-with the basics that a student master such as routine transi-ormation before progressing to ıore enjoyable combat employ-phase. Without the basic air-ıip skills, there can be no future stency.

ch of you knows when you exer-ir discipline, and each knows you don't. Violations may vary the minor to the flagrant, but nsequences of repeated violation l *bad*, none *good*. The dangers veloping a habit of negligence l be evident and require no r discussion.

ARATION

ective teaching and learning t occur until you establish a sional relationship with the t and determine his present f capability. This includes his tanding of fundamental aero-ics, airmanship, and aircraft s and performance. Get him lk flying''—the relationship n bank and lift, single-engine on, the effects of center-of-position and external stores ıration, the causes of inverted angup, and on and on.

Formal publications—Tech Orders, phase manuals, regulations, course syllabuses—are the authoritative basis of all flying and training. Anything you do as a pilot/instructor must conform to the framework provided by these documents. Adherence to this framework is necessary for the orderly progression of a student through a flying program. Naturally then, you must be intimately familiar with, and adherent to, these guidelines.

Following procedure, however, still allows you to exercise initiative and creative innovation in your teaching. A procedure is a mandatory action specified to be performed in a certain sequence or at a defined point. That's the science of instruction. The art of instruction is going beyond pure procedure to diagnose the technique itself—the HOW and WHY—and then to be able to explain and demonstrate the technique. What are your outside references? How rapid is the throttle movement? What G force is involved? Is stick movement fast or slow? What stick pressure do you feel? The examples are numerous. It is your responsibility to dissect every task for its obscure details, determine your technique for success, and impart this expertise to your student.

BRIEFINGS

There are three distinct types of formal briefings:

First, the *phase briefing*—This is designed to give all procedural information for a particular phase of training. It should cover objectives, aircraft systems, flying and emergency procedures. It normally follows an intensive period of academic ground school on the same subject.

Second, the individual *flight briefing*—The briefing guide list is a logical sequence of mandatory items to be covered. This is necessary for the orderly conduct of the flight. Too many instructors, however, tend to repeat the litany of briefing items instead of using the majority of the allocated time for discussion and questions about the techniques. For example, after students have been exposed to several range missions, you can complete the routine items in a few minutes, and use the rest of the time for in-depth examination of the mission—how do you achieve proper dive angles, airspeeds, pickle altitudes? Why is this a good Aim Off Point? Let the students brief specific events, describing procedures and techniques. Probe, question, and lead the discussion toward the desired result—namely, an understanding of the HOW and WHY, as opposed to rote memorization.

Third, the *debriefing*—This can be the most valuable of all since it takes place immediately following a flight and addresses events that are fresh in the flight members' minds. Can students identify their own mistakes? Do they know WHY errors were made? Do they know HOW to make corrections on the next flight?

In any briefing, keep your comments professional and calm, never personal. Don't forget the most important of all—point out something good in each student's performance. Leave each person with a feeling of anticipation for the next flight.

AIRBORNE

The fighter pilot doesn't function in a three-dimensional world. The traditional parameters of height, width, and depth bear little relationship to ground gunnery, ACM, dart attacks, or other routine aspects of fighter pilotage. There are infinite combinations of altitude, airspeed, acceleration, G force, turn rate and radius, bank angle, dive or climb angle that enter into the performance of routine maneuvers. You have the responsibility to assist the student in finding some meaning in this strange world where customary standards don't apply.

Limit the possible variables. If a hard altitude, airspeed, power setting, or dive angle is required, insist that it be attained. Reducing variables to an absolute minimum allows the student to practice from the known

to the unknown. Holding all but one variable constant helps the student appreciate the effect of manipulating each variable.

Be prepared for frequent TELL, SHOW, and PRACTICE. As the student develops complicated motor skills, you must tell him what is required, show him how to accomplish it, and then allow him to practice what he's learned. Naturally, it takes time and repetition to refine those skills, but the TSP sequence will remain valid.

What is the final objective? *Consistency!* Don't be lulled into complacency, if the student performs a maneuver flawlessly *once*. That could be luck. When he demonstrates proficiency several times on several flights, you can begin to suspect that he understands the immediate problem and how to consistently solve it.

"TALKERS" AND "STICK RIDERS"

There are, unfortunately, IPs who cover rote procedures in briefings and try to cover everything else while airborne. Sure, you have to give some instruction on the intercom and radio, but keep it down to essentials and primarily during demonstration. Let the student perform as much as possible without the distraction of constant chatter. You will find his concentration improves during periods of relative silence.

Don't ride the controls when flying dual! Nothing can be more frustrating to a student than feeling the IPs constant inputs to stick, rudder, and throttles. The student is trying very hard to get the feel of the machine throughout the flight regime. Of course, he can't possibly be consistent, if the IP is "on there with him." The only time you need to take the controls is for demonstration or to prevent disaster.

Supervisors and flight examiners who have identified a known "talker" or "stick rider" in the IP corps may want to apply a dose of his own medicine during his next dual Standardization Evaluation Check. That has been known to cure the problem!

GUARDING THE CONTROLS

You can easily recognize the professional IP returning from the dual flight. He can hardly unzip his G-suit because his hands are frozen into misshapen claws from guarding the throttles and stick. He gets in this condition from following through on the controls, but he never, never lets the student feel his presence until deliberately taking control of the aircraft.

Failing to guard the controls can be embarrassing at best, and hazardous to your health at worst. Consider the following true experience.

During ACM, a student in the front cockpit of an F-5B had cleverly trapped his adversary at his 7 o'clock. While the IP twisted around to locate the other aircraft, he neglected his primary job of monitoring the student and guarding the controls. When the student snapped on 8.5 G's, the IP was not prepared to prevent it. Results: They lost the engagement, the aircraft required an over-G inspection, and the IP ended up with a sore neck and a red face.

A WORD TO STUDENTS

The responsibility for flight instruction does not rest totally with your IP. You owe it to both of you to prepare yourself to receive instruction. Study intensively the Dash One procedures and required dire weapons characteristics and l manuals. If the instructor has to all his time and effort on su that are appropriate for self-stu will have less time for the HO WHY. It will be an agonizing for you and a frustrating one fo Conversely, a reasonable prep effort on your part will resu rewarding experience for both

ABOUT THE AUTHOR

An authority on military instruction, John Trobaugh ha much of his life teaching oth fly. He began a flying caree the USAF in 1950 and served Korean and Vietnam conflict combat pilot. His experience ation training spans over 2 and includes a wide variety craft. He has held positions structor Pilot, Check Pilot, Sc Commander, Wing Flying Officer, Wing Operations Wing Director of Operatio finally Chief of Air Trainin mand's Standardization Eva at Randolph Air Force Base, Since 1972, as a Northrop F- ations Officer and Training neer, he has been respons planning, scheduling, and s ing F-5 tactical flying traini grams for foreign forces.—C F-5 Technical Digest, *Aircra sion, Northrop Corp.* ★

THE PROFESSIONAL APPROACH

rce Communications Service
AFB, IL

he following question arose from a recently submitted Hazardous Air Traffic Report when an air traffic controller was providing an additional ce called, "Merging Target Procedures."

tion: What is a merging target procedure and is a controller required to provide this service?

er: You need to consult FAAH 7110.65a, Air c Control, paragraphs 526 and 510.

ragraph 526 provides the following information:

As an additional service, air traffic controllers merging target procedures to all radar identi-

(1) Aircraft at 10,000 feet and above.
(2) Turbo jet aircraft regardless of altitude.
(3) Presidential aircraft regardless of altitude.

merging target procedures were expanded in 978 to include the above aircraft rather than the ous requirement for only Presidential aircraft scheduled air carriers. Merging target proce- are not provided or applied to aircraft which stablished in a holding pattern.

Under merging target procedures, controllers traffic information to all aircraft whose targets r likely to merge unless the aircraft are known separated by the appropriate vertical separa- inima (for IFR aircraft it is 1000 feet below FL nd 2000 feet at or above FL 290).

f the pilot requests, the controller will vector rcraft to avoid the merger of the aircraft and nidentified target that was previously issued as

f the controller is unable to provide vector es, he or she is required to inform the pilot.

agraph 510 in the FAAH 7110.65a provides llowing information under application of addi- services:

a. The primary purpose of the Air Traffic Control System (ATC) is to prevent a collision between aircraft operating in the system and to organize and expedite a safe flow of traffic. In addition to the primary function, the ATC system has the capability to provide (with certain limitations) additional services. The ability to provide additional services is limited by many factors, such as the volume of traffic, frequency congestion, quality of radar presentation, controller workload, higher priority duties and the pure physical inability to scan and detect those situations which fall in this category. The provision of additional services, consistent with the aforementioned conditions, is not optional on the part of the controller, but is required when the work situation permits.

b. The controller has complete discretion for determining if he or she is able to provide or continue to provide a service in a particular case.

c. The controller's reason not to provide or continue to provide a service in a particular case is not subject to question by the pilot and need not be made known to the pilot.

Thus the provision of merging target procedures and subsequent vectors requested by the pilot is a mandatory requirement on the part of the controller if, due to work situation, the controller is able to provide it. The key to these situations is the timely communication of traffic advisories by the controller and the early request by the pilot for avoidance vectors. These two things will provide an extra margin of safety to avoid a hazardous situation. ★

Last of the
LATE ROTATERS

During the past year, there have been many questions concerning a phenomenon that came to be known as F-15 "late rotation," i.e., nose wheel liftoff speeds some 10-15 knots higher than normal. Using a service-supplied aircraft that exhibited these peculiar characteristics, MCAIR investigated the problem, discovered the cause, and recommended the corrective action. This article is presented to report on that problem and also to provide both Eagle and Phantom pilots with a good general refresher course on "getting the airplane off the ground."

Pete Pilcher/Experimental Test Pilot

Q–*What does it take to get the Phantom or Eagle nose wheel off the runway on takeoff?*

A—The aircraft must rotate about the main landing gear. To do this the moment created by the stabilator must overcome the moment that is the result of the weight of the aircraft acting through the center of gravity, which is ahead of the main landing gear. The stabilator will create a down force to provide this moment when it is deflected (aft stick) and the speed of the machine is sufficient.

WAIT A MINUTE!

If you have a hunch that all sounds too simple, your hunch is correct. Actually quite a few variables affect the nose wheel liftoff speed. Some of these are:

- Aircraft gross weight
- Aircraft CG location
- Stabilator position
- Flap position
- Aircraft speed at aft st
tiation
- Plus one other very ir
ing item that we'll call to y
tention a little later!

Since the effects of thes
ables may not be that obv
all of us, let's expound a bi

WEIGHT AND CG

As gross weight increas
tail-down force required to
this load must also increas

gineers in the crowd can sum moments about the main gear prove this fact.

his same sum of moments ut the big tires also shows that ne CG moves forward, the tail d required to rotate will in- ase and vice versa. If the CG e above the wheels, the air- ne would rotate at any speed, n in the chocks. That wouldn't good because it would require heel or strut at the back of the lane, but we sure wouldn't e a nose wheel liftoff prob-

eriously, center of gravity is of the most important varia- . It is also constantly chang- as internal fuel is used. The typically moves forward about MAC (mean aerodynamic d) for every thousand pounds P consumed in the F-4 (the CG moves ¼% *aft* in the e situation). If the F-4's motors on the ground for much more 30 minutes, the CG can e forward enough to cause e knot increase in the nose el liftoff speed. Unusually ground run time before com- cing takeoff has caused sev- takeoff aborts in the Phan- I also suspect that the CG at ne start is not known ac- ely enough to predict a nose el liftoff speed within a few s anyway.

HT CONTROLS

flow over the tail causes the lift downward, provided the of attack of the horizontal s correct, i.e., leading edge (aft stick). This makes it for us pilots since the same al action and response oc- in flight; i.e., pull the stick to make the nose come up ars and houses get smaller. applies to both the F-4 and

p position affects the speed ich the nose rotates. Flaps in flight causes a nose-down pitching moment that is generally trimmed out with little thought or effort in the F-4. It was this moment that necessitated the slotted stabilator on some models of the Phantom (not enough horizontal tail to trim the aircraft at extreme forward CG conditions during full flap landings in ground effect). The pitching moment with flaps in the F-15 goes essentially unnoticed by the pilot. The flap contribution to nose wheel liftoff is significant in both fighters. Flaps down tends to reduce stabilator effectiveness, which actually causes an eight knot increase in nose wheel liftoff speed in the Eagle and a 12 to 14 knot increase in the Phantom. Also, flaps up during takeoff in the Phantom makes the nose rotation rate snappy—one of the reasons the handbook says to use flaps.

STICK BACK!

Another variable that can cause a change in nose wheel liftoff is the aircraft speed at aft stick initiation. A couple of profound statements can be made regarding this matter. An F-4 in normal take off configuration would probably never rotate and fly off the runway without pilot-supplied aft stick. The F-15, on the other hand, flies off the runway at about 165 knots without any pilot action other than selecting takeoff trim before takeoff roll. The nose wheel liftoff speed will be increased as much as 12 knots by pulling the stick aft at 130 KCAS vs 100 KCAS in an F-15 at Mil power equipped with a full centerline tank. This basically means that we are probably delaying nose wheel liftoff by 5 or 6 KCAS by waiting until the handbook number of 120 shows up on the airspeed indicator.

WOULD YOU BELIEVE?

Now for the little item that we thought might interest (and surprise) you—another of the variables that can affect nose wheel liftoff speed is—believe it or not—the nose strut servicing. Nose strut servicing can have a significant impact on nose wheel liftoff in the F-15 and may have a similar effect in the F-4. If the nose landing gear strut is properly serviced, the nose strut continues to push the nose of the aircraft up during strut stroke to maximum extension. This aids in the nose up rotation of the aircraft. If the nose strut is loaded with too much oil, and therefore not enough air, it does not provide this reactive force throughout the strut extension and is less of an aid to the rotation of the aircraft. The degree of strut mis-service is another variable, of course.

Mr. Clarence Mongold, of our F-15 aerodynamics group, claims that a mis-serviced strut can cause a rotation speed increase of 10 to 15 knots. He supports his claim with the results of both simulation modeling and flight tests of a "late rotater" F-15 that we borrowed from Luke AFB this summer.

During the late rotater tests, we conducted routine checks of the gross weight, center of gravity, airspeed system, and flight control system, and found everything in order. The airplane was first flown as-received and gave a very rough ride on the ground. It felt as though the front spring was very stiff. On takeoff the nose wheel came off the runway approximately 10 knots late. Upon inspection, the nose strut was discovered to be considerably over-serviced with oil. Doesn't sound important, and the aircraft had the proper attitude on the ground, but a load-stroke test on the nose strut showed that the strut gave up most of its energy in the first half-inch of travel and did not help lift the nose after that point. The F-15 nose must come up about a foot before the nose wheel clears the runway, so the

Last of the late rotaters continued

strut was not much help in rotating the airplane after the first half-inch of travel.

It appears from the load-stroke curves of the F-4 that the same phenomenon applies; the strut aids in rotation throughout the two foot stroke of the nose strut.

THOUGHTS ABOUT NOSE WHEEL LIFTOFF SPEEDS

Nose wheel liftoff speeds have been a sporadic problem in the F-4 and F-15. About once per year per aircraft, one of these machines is aborted at high speed and high gross weight because the nose did not come up at the precomputed airspeed. In nearly every case, the brakes, wheels, and tires are consumed in the stopping effort. When a nose wheel liftoff problem is reported, the standard variables of CG, flight control system, and airspeed system are checked. Rarely is a discrepancy found with any of these variables. The airplane is then flight checked and found to be flight-worthy.

Since stopping a heavier than normal fighter from a higher than normal speed on the ground is not my idea of a fun time, I believe in and follow the following guidelines:

- Check the stabilator before takeoff in either the F-4 or F-15 for freedom from restrictions, for correctness of direction (stick aft = leading edge down), and for full travel in both directions. If the stabilators pass this test and the motors work, the airplane *will* rotate and fly. Maybe not at the nominal published speed, but it will in fact rotate unless the laws of aerodynamics are repealed or the stabilators suddenly fall off, neither of which is likely.
- Take the nose wheel liftoff curves with a grain of salt, ing that there are many va involved; variables that can c between the briefing roo the runway and can accou as much as 20 KCAS.
- Bring the stick back e the takeoff roll, except as tion leader on a formation g F-15 Dash One recommen knots for aft stick moveme all takeoffs. As we indicate lier, this may cost 5 to 6 k nose wheel liftoff speed in a machine. The F-4 Dash O lows more pilot judgment area. For most F-4 takeof pilot is merely reminded aft stick well below the nose liftoff speed.
- Make sure the nose strut is OK, OK? Looks can ceiving. If the ride's not write it up. Courtesy *Pr Support Digest*, Vol 25, 1978. ★

what do you know about wake turbulence?

isted below are ten multiple-choice questions which reflect the latest findings by the Federal Aviation Administration (FAA), and the National Aero-tics and Space Administration (NASA), concern- wake turbulence. Check your answers against those ne end of the test. Credit yourself witl 15 points per ect answer and if you have a score of 150, you have gh wake turbulence IQ. If your score is less than 135, tle research may be in order.

Vhen departing behind a large cargo aircraft, which ne following types of wind would result in the most istent runway turbulence?

a. Calm winds
b. Direct headwinds
c. 5-knot crosswind component
d. 10-knot crosswind component

)uring a calm-winds condition, a jet aircraft departs Runway 36L. When should an aviator expect the tur-nce to reach 36R if the distance between the two vays is 1,000 feet?

a. ½ minute
b. 1 minute
c. 1½ minutes
d. 2 minutes

Vhen does a departing aircraft start producing wing ortices?

a. At the start of the takeoff roll
b. At an approx. speed of 60 knots
c. At liftoff
d. When the nose is first rotated

Vhat conditions of airspeed, weight, and configura- would generate the greatest amount of wake tur-ıce?

Airspeed	Weight	Configuration
Slow	Heavy	Flaps down
Slow	Heavy	Clean
Fast	Heavy	Flaps down
Fast	Heavy	Clean

t what rate, and to what altitude will the vortices rated by an aircraft descend?

a. 500 fpm for 900 feet
b. 500 fpm for 500 feet
c. 1,000 fpm for 2,000 feet
d. 1,000 fpm to ground level

6. The major danger associated with the high exhaust velocities of large jet aircraft would be present during which type of operation?

a. Landing
b. Takeoff
c. All flight operations
d. Ground operations

7. When taking off behind a departing jet aircraft, a good technique would be to:

a. Lift off prior to the point of rotation of the jet and stay above or away from its flight path.
b. Delay liftoff as long as possible to create excessive airspeed for penetration of the vortices.
c. Climb to 500 feet, level off and turn so as to cross the vortex path at a 90-degree angle.
d. Adjust the flight path so as to penetrate the vortex core 500 feet below the generating aircraft.

8. Generated vortex cores range in diameter from 25 to 50 feet. How are the two vortices of an aircraft affected by time?

a. The cores rapidly expand until they overlap and dissipate.
b. They stay very close together with little expansion until dissipation.
c. They gradually reduce in size until dissipation.
d. Depending on the atmospheric conditions. they sometimes increase or decrease in size.

9. Which of the following tangential velocities would approximate those created by the C-5A or Boeing 747?

a. 500 fpm
b. 5,000 fpm
c. 9,000 fpm
d. 15,000 fpm

10. Which of the following encounters with wake turbulence would probably result in the greatest loss of control of the penetrating aircraft?

a. Crossing the wake at a 90-degree angle.
b. Climbing through the wake at a 90-degree angle.
c. Climbing through the wake on the same heading as the generating aircraft.
d. Flights 1,000 feet below the generating aircraft.

ANSWERS TO THE ABOVE QUESTIONS

1.c, 2.d, 3.c, 4.b, 5.a, 6.d, 7.a, 8.b, 9.c, 10.c.

the domino e

This story is about dominoes. As it unfolds we can see each of those spotted rectangles fall as a minor problem escalates into a serious mishap.

All went well for two young pilots in a T-38 until they lowered the gear for landing and the left main green light in the rear cockpit did not illuminate. Up front all was normal. The IP, in back, pressed to test the left gear light and it worked but went out when released. The warning test circuit produced the same results. Finally, using the rear cockpit mirrors, the IP confirmed the gear down and they continued the approach without notifying the tower of their problem. After landing safely, they taxied to parking and shut down, despite directions in the Dash One and the wing manual to stop straight ahead and have the gear pinned before taxiing with a system malfunction.

First domino down.

Since neither pilot knew whether the front and rear indicators were separate or interdependent systems, they asked TA to troubleshoot the gear warning system. TA couldn't, so they called home base and got a maintenance NCO who passed them to the NCOIC who discussed the problem with the assistant detachment commander. They decided the gear was safe, but the assistant commander advised that only straight-in, full stop landings should be made. The crew took this as an okay to continue their mission.

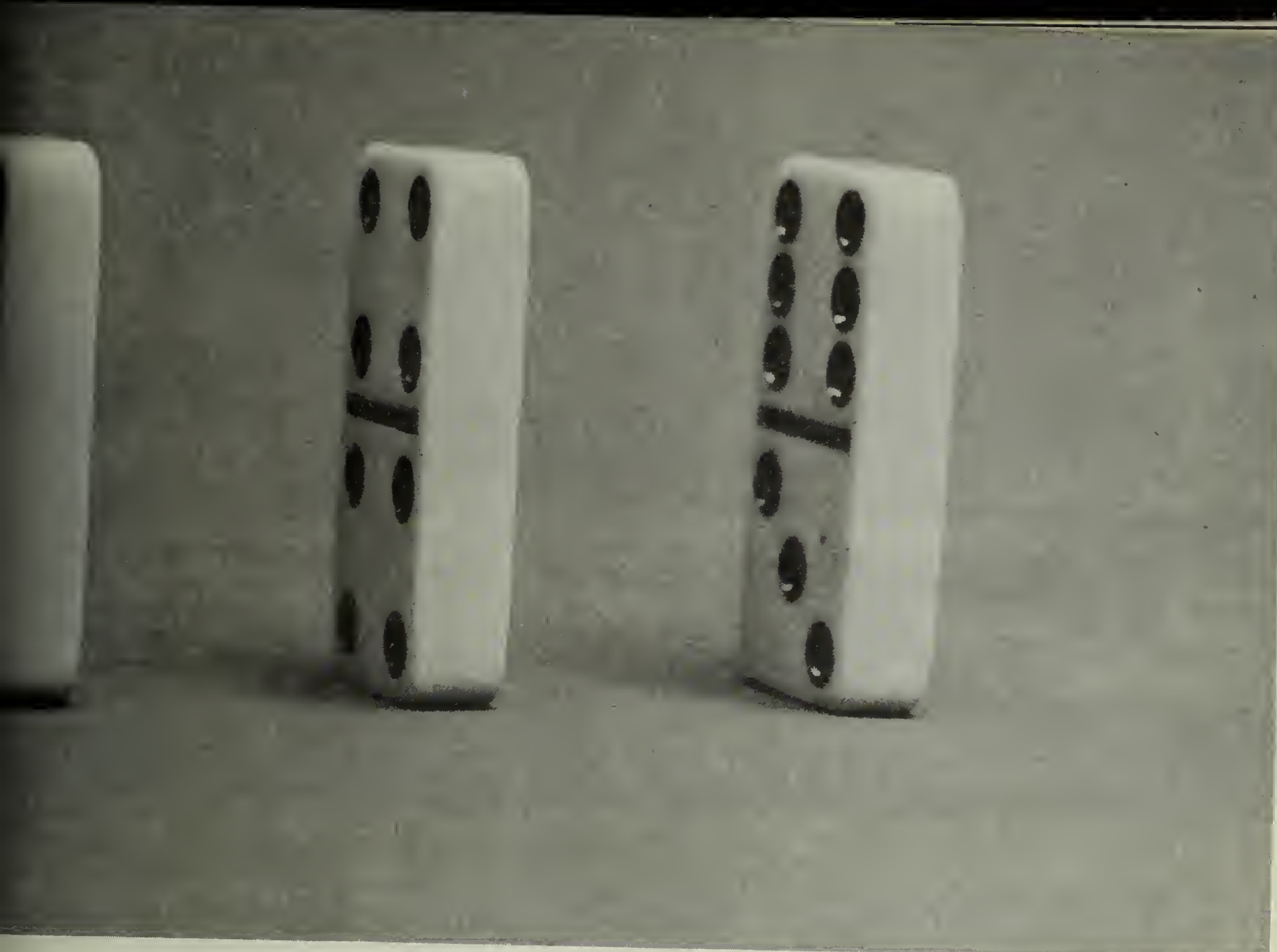
The NCOIC later said that if a writeup describing the indications in this case were made on a local flight, he would enter a red cross on the writeup. He felt also that a gear retraction test would be necessary to clear the red cross. And he knew the warning systems in the two cockpits were separate and the one in front should be valid.

The TA supervisor later said if he had known of the situatio would have entered a red cross had a specialist troubleshoot th system. There was no writeup, however, so there was no actio

Following the mishap, the assistant detachment command said his instructions were advis only, and continuance of the fl was left to crew discretion. **Ar domino.**

The crew checked the gear switches and got a green left g light when the battery was turn during preflight. So they launc on their next leg, a night fligh **Down went another domino.**

Again, as they configured fo landing, the left gear safe ligh failed to come on. This time th mirrors were of no use becaus the darkness. The crew decide try a full stop landing, but aft



down the aircraft settled to the
nd they went around. **Domino**

this point the crew realized
had a serious problem and
ed to declare an emergency.
asked for foam and said they
l make a pass by the tower.
ver, darkness prevented the
crew from seeing the gear.
the pressure building, the crew
own the left engine, depleted
ulic pressure and tried another
ate release. No change in
it indications. Another tower
and gear check by a
pter brought a report of main
but nose gear not visible.
other landing attempt was a
ion of the first, a settling to
t and a go-around. The IP
sked for foam for a gear up
g, but only 700 feet had been
efore their fuel state dictated
nediate landing. Then on final

they were directed to go-around because the foam truck had stalled on the runway. Jaws were tightening as the aircraft made a tight 360 and landed over the stalled truck some 3,500 feet from the approach end. The aircraft slid 2,600 feet and halted. The crew egressed safely.

During the ensuing investigation, the cause of the unsafe gear indication turned out to be a loose ground wire. Actually the gear was safe all the time; however . . . **Domino number 5.** The left main gear strut was flat, which caused the aircraft to lean to the left on landing and led the pilot to think the gear was not down.

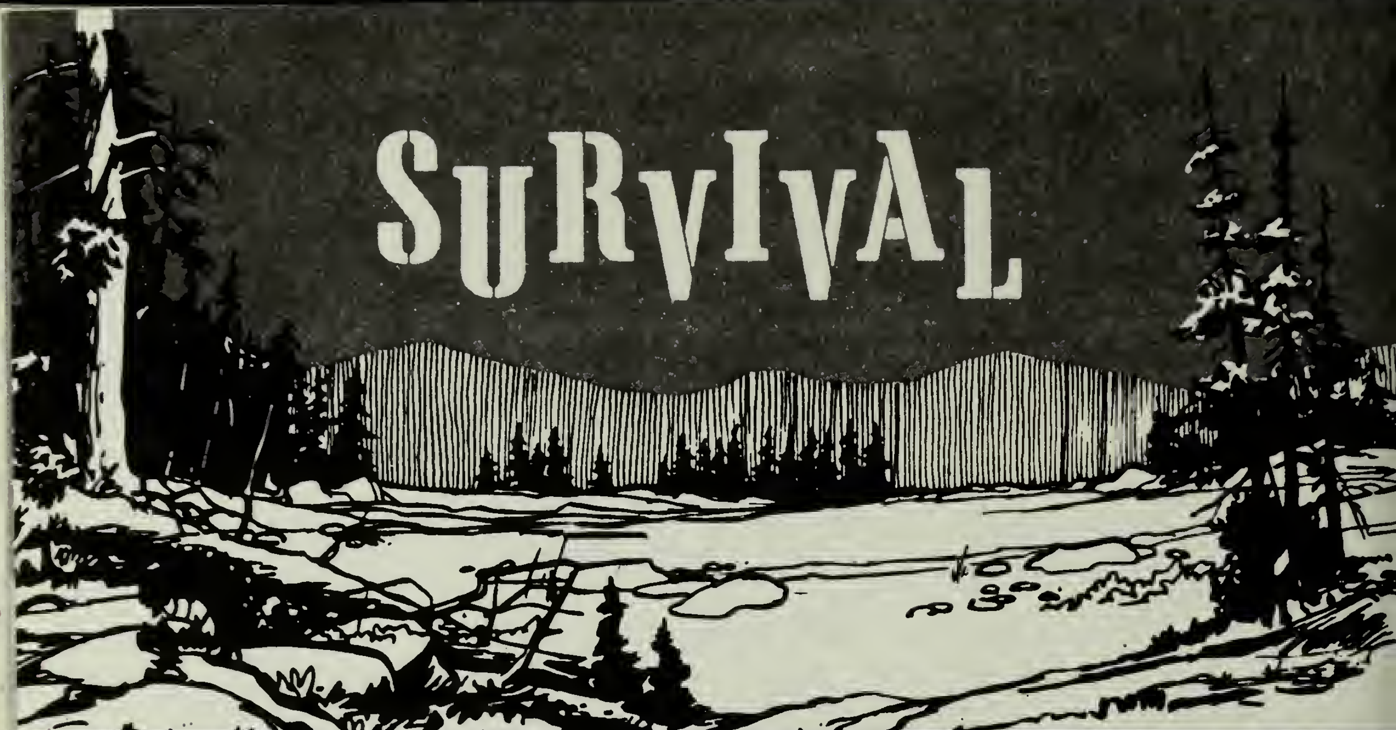
Let's go back over the dominoes:

- Unsafe left gear indication.
- Less than outstanding supervision.
- Indications of gethomeitis.
- Darkness.
- Deflated left gear strut.

The domino effect has been applied to many different situations. It is most appropriate for aircraft accidents. Time-after-time, accidents could have been prevented if someone had removed one of the dominoes. For example, a crew overflew several air fields while the condition of their four engine aircraft continued to deteriorate—one engine after another until, with only one left, they encountered weather and went in.

Example, an F-101 pilot continued a night mission after experiencing attitude indicator malfunctions that made it difficult for him to maintain altitude control during turns. The aircraft subsequently pitched up during an intercept and was destroyed.

Some broke the chain by removing a domino. Those have been the smart ones. Use your smarts, don't let a domino get you. ★



The Secret Of The Desert

Sgt Edward Smith • Det 2, 3636 CCTW • Nellis AFB, NV

The misconceptions and folklore surrounding the hostility of desert environments have led many people to believe that it is impossible to survive in the arid stretches of the Sahara, the Gobi, or even the Great American deserts. True, there are documented accounts of people who have simply gone into the desert and vanished. Why? Was it misfortune, lack of knowledge, or a lack of preparation? Perhaps it was a combination of all plus a failure by the individual to maintain a strong will to survive. Whatever the reasons, the myths have always been a part of desert survival. Myths have contributed to the overall fear and apprehension attached to being stranded in an arid stretch of land we call a desert.

For the purpose of this article, a desert is a dry region rendered barren or partially barren by a lack of rainfall. The average annual rainfall in most deserts is 10 inches or less. Some receive little or no precipitation for several years then are deluged by heavy rains in a short period of time due to some freak change in climatic patterns.

Many people picture the desert as nothing but miles and miles of shifting sand dunes. That's not so. The largest desert in the world, the Sahara, is only 10 percent sand, while the Arabian Desert has only 20-25 percent, and the deserts in the southwestern United States contain even less.

Desert areas are noted for extremes in temperature and dryness and a general lack of vegetation. Yearly temperature variations will range from below 0°F during the winter months to a high in excess of 130°F in the summer. Daily temperature fluctuations between day and night may be as much as 45°F.

All these morsels of knowledge are fine, but it is more important to recognize the impact these factors will have upon you as a survivor in a desert climate. First, the temperature extremes will dictate protection from the sun's rays during the day and insulation from the penetrating cold at night. Second, the lack of water will be your most crucial concern. Without adequate water to replace normal body losses, your expected survival time is only a couple c at best.

Water plays the most imp role in your body's functions. out this precious ingredient, th will cease to operate. Under everyday conditions, you'll a minimum of two quarts of per day. Because of the stress i by high desert temperatures, th requirement is doubled. Wi creased physical activity or ex exposure to the sun, the 4-qu day water requirement may b bled or even tripled; therefore survival time depends upon th perature and the amount of wa have available. At 90°F, wit four quarts of water per day would be expected to live 10. however, at 120°F, your su time is only 2.5 days!

Your body controls heat pri through evaporation of secreted ture (sweat) on the skin surface. your body temperature increa to eight degrees above normal extended period, death is Therefore, you need a con intake of water to allow norma

ıs to occur and maintain normal near-normal body temperature. If ı lose 2½ percent of your body ght, or about 1½ quarts of body er, you'll suffer a 25 percent loss efficiency. Also, by working in peratures of 110°F, your effici- y is reduced by 25 percent. If the events occur simultaneously, are operating at 50 percent normal ciency.

ı addition to water losses incurred ugh evaporation, the body loses r through respiration, defecation, urination. All of these losses to be combatted in order to pre- dehydration and incapacitation. u become dehydrated, the symp- you can expect are dizziness, laches, lack of salivation, slurred ch, nausea, flushed skin, and siness.

is all sounds very bad, but there everal things you can do to pre- dehydration. First, drink plenty ater. You'll probably have a very ed supply on hand, but it is im- nt to drink what you have, as eed it. This will maintain your efficiency for a longer period ne. Your body needs water to e perspiration and to supply for circulation. When the body drates, the blood loses water, nes thicker, and volume is re- . The result is more work for eart and less efficient circulation. These facts point out the fallacy in the old wives' tale which advocates rationing your water. Rationing water will only lower your body's water level to a dangerously low point! You merely lose efficiency quicker.

Your need for water can be controlled, to a certain extent, by rationing water *loss*. This can be done by three interrelated methods. First, keep your activity to a minimum! Work or travel is more desirable at night when the desert is cooler. Second, stay in the shade! The sun of some deserts can literally bake you. You must locate and remain in a shelter that will protect you from the sun and the wind, yet allow cooling breezes for ventilation. Third, keep your clothes on! Clothing will protect you from the sun's rays and absorb your perspiration. Sweat absorption extends evaporation time, and the cooling effect created within the clothing will retard water loss.

Although water is the critical factor in desert survival, food *may* become a problem, *if you have water*. You can live for weeks with no food, but only a few days without water.

Don't plan on living entirely off the native vegetation, although it is possible to supplement the concentrated foods in your survival kit with wild plant foods in many deserts. In the American southwest desert, edible plants are more abundant than in the Sahara, Gobi, or Arabian deserts. But keep in mind that it may take more energy to gather the food than you'll get by eating it.

Animal food is available in some deserts, but the benefits from your exertions could be counter-productive. When meat is digested, the liquid water products must be eliminated from your body through the kidneys. That takes water. If your water supply is low, it may be wise to sun-dry any meat and save it until you have a more abundant water supply.

Desert insects are a good food source, but digesting them also requires water. If your water supply is low, you may want to forgo insect food.

You may be able to get help from desert people. They'll recognize your sign language for, "I'm thirsty," even if they don't understand your words. Once contact has been made with natives in any desert, food and water are usually available. During normal times, desert people tend to be quite hospitable.

Your survival in the desert may depend upon the knowledge you are willing to accumulate about the desert and the skills you develop to combat the forces working against you.

Living in desert conditions isn't easy, but it is possible. Confidence is gained through the positive perceptions you have about yourself and your own abilities. ★

No Walking at all.

ax. Daily e Temp° F.	Available Water per Man, U.S. Quarts: 0	1	2	4	10	20
	Days of Expected Survival					
120°	2	2	2	2.5	3	4.5
110°	3	3	3.5	4	5	7
100°	5	5.5	6	7	9.5	13.5
90°	7	8	9	10.5	15	23
80°	9	10	11	13	19	29
70°	10	11	12	14	20.5	32
60°	10	11	12	14	21	32
50°	10	11	12	14.5	21	32

Walking at night until exhausted and resting thereafter.

Max. Daily Shade Temp° F.	Available Water per Man, U.S. Quarts: 0	1	2	4	10	20
	Days of Expected Survival					
120°	1	2	2	2.5	3	
110°	2	2	2.5	3	3.5	
100°	3	3.5	3.5	4.5	5.5	
90°	5	5.5	5.5	6.5	8	
80°	7	7.5	8	9.5	11.5	
70°	7.5	8	9	10.5	13.5	
60°	8	8.5	9	11	14	
50°	8	8.5	9	11	14	

This is Table 17B, p. 279, In Physiology of Man in the Desert, by E. F. Adolph and Associates, New York Interscience Publishers, 1947. Note that survival time is not appreciably increased until available water is about 4 quarts, the amount necessary to maintain water balance for 1 day at high temperatures. Utilization of shade or saving a few degrees of temperature is as effective and as important in increasing survival time as water.

Pass It On, COLONEL

REPLY TO ATTN OF: Lt Freshout of-UPT
SUBJECT: Dissemination of Flying Experience
TO: Colonel Megahours Pilottime
Attached For Flying
Anywhere AFB

Sir, I hope you will not take offense at anything that I have to say. I may step on some toes, but I think that these things ne be said. The fact is, sir, I neec

Let me begin by saying tha you in great awe. You flew in and Korea. You've flown ove and bombed places that I have read about. While you were c MIGs and dodging SAMs, I w the backyard playing soldier w stick-guns. Your stories keep enthralled for hours. You've f

17s, P-51s, F-80s, Huns, odoos, Deuces, and many more. ny. I never had that many plastic dels! You've had every in-flight ergency twice over. You've ded at fields that were WOXOF. u've buzzed houses and water ers. You've even flown under dges and power lines.

ou are a modern day barnstormer be held in high esteem. You have aura about you that all old fighter ts have. My fellow brown-bars l retell your stories even when aren't there. "The colonel said he was chasing a MIG in an 6 once and . . ." we say, as we intercepts with our hands. It's ting mythology, your mythology. are our "God of Flying." We ship, respect, and attempt to . If only we could become a ter pilot like you, we dream!

nis, sir, is the problem. Many of oung pilots look upon you as the el for our flying development. strive to be like you in every Therefore, when you talk of ting regulations, buzzing houses, we see this as part of "being a fighter pilot."

r, I'm asking you to take a long, look at yourself. Are you giving e right example to follow? Are being the correct frame of ence on which we can base our g? Are you doing all you can to l professionalism and safety in t's not really your deeds that we copy. We try to emulate your des. After all, we want to be r pilots, too!

t me be specific. You routinely up 20 minutes before our ff time. You are ready to fly— checking weather, preflighting equipment, or briefing the on. What are you telling me a pilot's responsibilities? Sure, ks sporty to fly with your s rolled up and your gloves down; and who needs a checklist? What are you telling me about a pilot's regard for safety? You've flown at 400 knots below 10,000 feet all your life. ("Haven't got a speeding ticket yet!") What are you telling me about a pilot's regard for regulations? You are constantly asking me for ops limits, holding airspeeds, gear speeds, flap speeds, and pattern procedures while *you* are flying. ("I never can remember. . . . What's our airspeed on final?") You even need coaching to fill out a boldface test. What are you telling me about a pilot's professionalism?

This all seems like such a waste. The Air Force has invested 25-plus years and five thousand hours in you. Your expertise and experience is a high resource that remains untapped. You could use them to help us who so desperately need it, but you don't. You fly the entire mission while I play navigator, radio operator, and passenger. Have you ever thought that the techniques you've picked up over the years could help me to be a better pilot? If I never touch the stick when we fly, how can you evaluate my flying? How can you help me to improve? The Air Force, and eventually all of us, are the losers. Don't hang on to the cockpit just because you can. Help us low-timers to be better pilots because we have flown with you. Use your experience to help us safely and professionally get our experience.

Remember, we who are still wet behind the ears are attempting to copy you and your ways. You are continually being studied by those of us with few hours. You are under the spotlight. Our focus is on you. For that reason alone you should show us the highest degree of professionalism at all times. (It's like a tax you have to pay on your five thousand hours.) Help us to see the best you have to offer. Give us the professional example that we need and deserve. Demand professionalism from yourself so that I will see that example and emulate it.

Think back to the last time that you held us in awe with your daring deeds. Now, when was the last time you told us about canceling a mission for weather, going missed approach, turning down an unsafe airplane? When was the last time you bragged to us about your professionalism?

Don't forget us brown-bars, sir. Let us learn from your example of a truly professional "fighter pilot." We need You!!

Freshout of-UPT, 2Lt
Anywhere AFB ★

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Ride the WILD horse

Part o

Years ago *Aerospace Sa* featured a series of three articles on helicopter flyi Major Charles O. Weir, was assigned to the Helic Flying Training School th located at Stead AFB, Ne Since then we have had p requests for reprints and of the magazines. Recentl because of events that oc during a search for down aircraft in mountains, int has again been generated series. The articles dealt helicopter flying in moun The aircraft have change the mountains, winds, hi density altitudes and turb haven't. So we are reprin the articles, with some ed in this and the two succe issues.

The story that follows was not designed to entertain other helicopter pilots nor to toot any horn in any way, rather it is aimed directly at some of you indifferent type supervisors, the "I've got 'em (helicopter), but I don't want 'em types." The helicopter is a complex machine requiring a pilot with the skill and dexterity of a bird. To see him perform is deceptive. To understand why and how he performs is the problem. I hope to help you on your way to a better understanding of the business of being a chopper pilot.

It was a beautiful, warm vember afternoon at Randol the boss called me in. "Chu would you like to take two Alaska and ferry two H-21 to Olmsted?" Momentary

Charles O. Weir

backs quickly reviewed the
: to me. December temperatures
ywhere from 0 to −60 degrees,
d hours of daylight, rugged ter-
broad valleys, unexpected snow-
s, turbulence and high winds
ll the other things in the Arctic
are relative to flight planning;
I had learned and experienced
previous four-year tour of chop-
ying in Alaska. Despite a slight
hension of unforseeable dan-
which attach themselves to a
t such as this, I replied, "Yes
hen do we leave?"

our C-118 approached Anchor-
ll looked peaceful and serene,
kling panorama of snow-cov-
nountains and valleys flushed
ne sparkle of winter, and Cook
eflecting the total beauty of it
ne tranquil effect of this land
attered by 40 degrees below
mperatures as we stepped from
craft. For the first time, the
crew was shaken into utter,
eality of arctic temperature and
nbing effect it has upon you.
r a week of preparation, at
vorable weather was predicted:
nd sixty all the way to Palmer,
st stopping point. Temperature
hold at −58 to −62. Winds
Elmendorf, three to five knots
ep Mountain Pass, five to ten
t Gulkana, and about the same
rthway. Time en route was
ed as 4:40. A full fuel load of
ounds (we carried extra tanks)
ken on. Flight characteristics
onsidered good at this gross;
the extra fuel was not needed
leg but would save us time
ort in refueling by hand pump
below. The interior of each
er presented a conglomeration
of equipment, fuel cells, B-4 bags, large duffle bags of arctic survival gear, heavy tarp-like covers for blades, windshield, rotor heads, dorsal fin, etc. In fact, there was just enough room left for the crew chief to park himself on the front edge of the troop seat near the forward rescue door.

Due to loose powdery snow on the runways, we made short running takeoffs and were on our way. The time was 1030 hours. Because of our heavy load, full climb power was utilized. The rate of climb was only 150 to 200 fpm but there was no sweat as rough terrain was still 40 miles away. We leveled off at 1000 feet and settled down to the routine business of nursing our wallowing hulk on its way. As we approached Knik River, we encountered slightly gusty conditions, nothing to worry about as it was probably a little turbulence coming down from Knik Glacier about 20 miles to our right.

After crossing the river, we picked up a little headwind and the gusty conditions had all but disappeared. Looking down at the ground, I could see swirls of blowing snow moving across the fields of the Matanuska farms. I figured our headwind as being about 20 knots and knew that blowing snow on the ground was caused by at least 30-knot winds. There was only one place the wind could be coming from: down through Sheep Mountain Pass, the most rugged leg of our route.

Years ago while flying stiff winged aircraft through this pass, I had encountered some mighty blasts and terrorizing turbulence in this area, and had all the respect in the world for avoiding going through Sheep Mountain Pass when she was on the rampage. I was on the edge of decision to turn back knowing that you can give the arctic winds credit for getting worse instead of better when you are trying to get through. Turbulence was picking up a bit, moderate for a helicopter but not to the point of alarm. Airspeed was reduced and rotor rpm was increased.

At 1110, I called Elmendorf Tower and asked for the winds from Sheep Mountain radio and their reply was "four knots." They further stated my route forecast winds would hold. Still not alarmed, I couldn't figure where the chinook winds were coming from. The only station with any winds at 20 knots was Talkeetna, 60 miles northwest of our position. Impossible that we were riding a feather edge of that flow. Forty miles ahead was a glacier field at an elevation of 8000 feet. Could these ice monsters be generating a flow that was shooting down through a cut in the hills? Of course. That had to be where the winds and turbulence were coming from. Cold air spills and tumbles down through the valleys, cuts and gulleys like onrushing tides of water. By climbing, maybe we could escape the high velocity areas of this stream and in a few minutes be in the waning edge of this invisible force. Luckily, at this check point we have a dog leg to the right; if only we can get to the turn, we shall be free from the grip of this ugly, unseeable monster.

Full climb power was applied. At 1500 feet with 2600 rpm and 42 inches, we suddenly nosed up and over to the left. Rate of descent at full climb power was 2000 feet per minute. We were in a dive! Airspeed 110 knots; Controls would not respond! Downwind! Fifteen thousand pounds and a

Ride the WILD horse continued

double load of fuel would surely make a big splash! Full back stick, trying to turn, any control response would help – got to hold power; can't slow airspeed or rate of descent. Good Lord, I'm not flying this thing; I'm merely hanging on to it! Is this real? Why doesn't the damn nose come up? The family – what is their day like – the smiling faces of the youngsters. Wonder what the future holds? Still no response! Dive angle is about 60 degrees, still going – nothing helps; sweating through my parka; trees are inevitable. We're going to hit – maybe five seconds left!

A smashing jolt from reverse G forces! We're going up! Up! We are pitching up – rotor speeding up – decrease collective pitch – reduce rpm – can't overspeed – 1500 feet per minute up – a delirious feeling!

Imagine 15,000 pounds autorotating upwards at this speed. Recovery! I'm tired; I'm soaked with sweat. I'm confused as though I've been hit a knockout punch – level, all under control! Think! Think! What can I do? How can I guess? What is the right action to take? Do that famous 180, boy! That's the impulse – the urge – no wait. Don't turn your tail feathers to that blast – you will tumble.

Wham! Here we go again! Winds must be over 80 knots – we are in a swirl! Down – down – we're still flying – I thought the aircraft had broken in half. May be imagination, ripping and tearing of metal. How can the chopper stand the punishment? How can we? Rate of descent on the peg 6000 feet per minute. No, no – it can't be! Surely I'm seeing things – dive angle at least 70 degrees! Surely the wooden blades can't take much more – flapping, stalling, compressibility. How can they stay together? Do we have control failure – controls are useless. Poor copilot, I'm beating his legs black and blue with the cyclic. He's trying to get his legs out of the way but can't. Wonder what he thinks – probably that he should be back in Iowa selling corn to the local granary. Call the other aircraft. See if he has us spotted – will make it easier for the ground party to eventually get to us – only a hundred or so feet above the trees now.

"Dave," I yelled into the boom mike. My breath was jolted out of me as we again reversed direction and started up – nose high 35- to 45-degree angle – going up like a homesick angel! Control! I've got control! Big open field below. I'll land. No, can't do that – no rotor brake, it will tear the blades off trying to get them stopped. What can we do?

The thought of a 180-turn to Elmendorf was a strong compulsive urge. What could we lose by trying? Negative, we'd tumble like a rolling sagebrush if we tried to run downwind in these conditions – not enough aft cyclic control to keep the tail down. Call the other aircraft. See what his conditions are and what his position is. Good, he's a mile behind and about a mile to our right, in turbulence and wind, but not in any serious trouble.

I'm right! The wind is coming through a slot eight to ten miles ahead of us; to our right, maybe three to five miles, is the waning effect I am searching for. How to get there. Now a crosswind from the right. Full right stick and rudder – she won't come around – here we go again! Nose going down, being blown into a descending left turn. Not severe this time – am controlling rate of descent and partial rate of turn – help the aircraft turn! Let up on right rudder, try natural cyclic; that's it, it's coming – rate of descent is steady – head for the airstrip – keep control – easy
we're doing fine. Call Dave
how close to the strip he is
he's only a mile or so away. S
be right over. "Keep your eye
buddy, I'm still not sure we
made!"

Holy Smokes! A real b
brewing on the ground – win
be 60 to 70 knots, blinding sno
ing and tumbling every whi
Regardless of winds and v
and snow, we have to get
ground; better to tear the bl
on the ground than in the a
down procedures would be a
the voice of doom had spoken
rattle and roll, fight! Got to
upright. The strip – we can
Easy now, slow the airspeed
knots we are hovering; ease
Over the strip. One hundred f
reduce collective. That's it,
down slow – up we go! Reduc
tive! Slam – now down. Up
lective. My God, we're mak
a 7½ ton yo-yo! Quickly no
the pitch stick down. Forget
hard landing – have to get it
keep it on! Call Dave and h
come in for landing to m
"Roger, looks mighty bump
give her a go!"

What instructions do you g
copilot (he, too, is an IP)? T
book says "Use Caution."
ance in this case. Do you
back to 2000 and let the bla
Or, do you hold 2500 rpm an
chance on a big gust lifting
yo up to a hundred feet ag
some reason or other, I chose
and I didn't have to tell Rob
he could expect. I got out, lo
shoulder harness and seat
Robbie wouldn't have any
distractions to worry about ar
for Dave to approach and lan

atching Dave approach the strip
is if I had had my picture taken
vas now looking at it. Up—down
rges of power—a real fight!
ing, actually, to watch man and
ne battle the uncanny treacher-
vinds that were blowing with
rd force and velocities. Bang!
on, or he was. Steady boy, you're
out 50 feet. Try again—easy
1 go—that's it, that's it, reduce
-wham it on! Hold rpm. Good!
e on!

mbed aboard and went forward
to Dave. "Hi, old buddy—
oes it?" Asinine question but
oked a grin from Dave. "Now
e are on terra firma—what next?
try for Elmendorf?"

t NO, but HELL NO."

od, I'm with you, ole friend."

this time the airspeed needle
lting up and down. As little as
ts. Steady around 55 knots and
1 as 70 knots! Fortunately the
vere heavy or there would not
een any possible way to keep
om flying when battling such
usts of wind. Several light air-
ad broken their moorings and
ering and flapping in the wind.
was the office of the bush pilot
orked from this strip. Obvi-
o one around. Better check and
here is a phone in the shack.
t easy to make my way through
owdrifts and the howling winds
larly at 40° below zero) to
k. There is a phone! It works!
tor, emergency government
call to Base Operations, El-
AFB, please."

moment, please, I will try
nect you."

e Operations Airdrome Offi-
king. What can I do for you?"

dy Boy, this is the pilot in
d of the two H-21s that de-
our base an hour and fifteen
ago and you can plant a hefty
boot to the derriere of your blankety-blank weatherman who goofed on my briefing, that's what you can do for me! We are on the strip at Palmer 35 miles from Elmendorf and we are staying her until these blankety-blank winds die down. Close out our flight plan. If you don't hear from me again tonight, you will know that we shut down safely and don't need any help."

"Yes, sir. Gee, I don't understand it. Pilot reports moderate turbulence around Skwentna and Talkeetna but none from your area."

"Well, old buddy, you're getting a pilot report now. See ya."

Outside both old hens were still squatting there as though the eggs were about to hatch, Robbie was glad to see me. The aircraft had tried to fly a couple of times during my absence. He reported one gust of nearly 80 knots!

"Dave, I'm going to hover over next to that clump of trees and try to shut down—maybe the trees will give us enough windbreak to safely stop the blades."

"Roger, buddy. We will wait here until you have it made."

Trying to hover sideways was as critical as the approach had been; up, down, narrowly avoiding sharp ground contact by full power increases and using full control movement to keep her into the wind took all my effort and attention. Finally, after what seemed an eternity of fighting, we hovered into the windbreak and nudged the forward rotor as closely into the trees as I dared. I called Dave and invited him over to join up on my left side. He experienced the same difficulties that we had. He set his bird down about 50 to 60 feet from us. I told him to throttle down—watch the blade flapping and when rpm was right, to throw the clutch switch into the friction position. This would be the crucial point to the shutdown—as blade rpm would be around 100 rpm (a very high flap potential) and to prevent extreme damage to the clutch, 30 seconds should be allowed to use the friction position on and off to slow the blades smoothly. Too much fric-

Ride the WILD horse continued

tion would create a sudden stop and cracked blades could result.

As we decreased blade rpm, flapping was severe. The tips were bouncing up and down from six to ten feet. I didn't know what the mechanical limitations of tip flap were but could well assume that part of the total flap arc could be attributed to blade flexing. At any moment we fully expected a blade to slap into the fuselage. Rpm kept decreasing down, down, friction now! Hit it again! We had done it—blades were stopped and still intact!

I glanced over at Dave's aircraft. The rear set of blades were flapping through a 10 to 15 foot arc! Apparently he was judging the safety of the operation by looking at the forward blades. They were flapping but not to the dangerous degree the rear ones were. My radio had faded out due to the low engine idle speed—the generator cuts out at 1300 rpm. I couldn't call Dave to tell him to add rpm to avoid the rear blades from striking the fuselage.

Quickly I unbuckled and clambered through to the rear door and as best I could, was trying to beat my way over to tell Dave of the hairy situation. Leaning full forward into the blizzard, I looked up in time to see the retreating blade on the rear rotor zoom way high. I knew this one was going to come down and tear into the fuselage. I dove forward, face down into the snow to present as small a target as possible for the shrapnel pieces of steel spar and wood that would soon be slinging themselves from the rotor system. I dared look up in time to see it happen. From reading of past H-21 accidents, I knew that some sections of the blade spar could be thrown nearly a quarter of a mile and could cut small timber in half. The blade suddenly hit its peak of upswing and then slashed as suddenly as a cobra into its victim, the fuselage. As the blade sheared and went sailing on its way, the unbalanced rotor system caused the airframe to shudder violently like an elephant doing the rhumba. The next two blades whopped off the two vertical stabilizers. Sections of spar and wood flew in all directions. The rotor system turned only about five times and stopped. Only the howl of the wind was to be heard and it dawned on me that I was still in one piece. Impossible that a man could stand in front of a firing squad and not get hit by one bullet. Those were the odds and I had beat them!

As I climbed forward through Dave's aircraft, I could see that Dave and Harry had their helmets off and were just sitting there, dejected and yet thankful the ordeal was over—one way or the other.

On the bus ride back to Elmendorf I decided I'd better send a wire to Texas, "Mission over, not completed, more to follow."

The shattered H-21A was put on a flat bed and returned to Elmendorf. Four days later, I flew my bird back to Elmendorf. It had seven red diagonals on it for popped rivets and wrinkled skin. The chopper had been gone over by highly qualified people—a structural engineer, a maintenance officer and inspectors—only my crew was afraid to fly it back. We were the ones who had ridden the "Wild Horse." I had a feeling that the fore and aft rotor masts were out of vertical alignment with each other and that the aircraft should not be cleared for even a one time flight to Elmendorf without benefit of a levels and protractor check. My opinion was not honored; the bird was cleared. Needless to say, we flew low and slow *all* the way back. Six months later I learned of the disposition of the two choppers. My bird wa[s] to have a twisted fuselage and out of alignment. Both H-21A returned to Z.I. by C-124 airli[ft] old Line Sergeant put it thi[s] "Both of 'em, Class 26!"

Let's re-hash this story. we can place the blame for successful mission somewhe[re] fore leaving Texas, I had ca[lled] the proper authorities of the p attempting this assignment. I recommended that if no urge[nt] existed to move the aircraf[t] should be put in storage and no made to fly them out before l[ate] or early June. If there was mediate need, why not airfreig[ht] out in C-124s? The decision mine to make—all four pilo[ts] highly qualified. All the weath[er fore]caster had on his chart was a b no stations reporting abnorm[al] conditions, no way of guess a phenomenon existed only distance away. The clearance in base ops had no reason t clearance. The pilot in co[mmand] "Me," what about this guy? blame? Maybe so, maybe n[ot] sonally did not receive any c on any of my actions or de[cisions]. Doubt, yes. My answer to in doubt was, "There were n[o fatali]ties, there were no injuries; I a[m] ful, I think I did right."

We have the requirement, th vision, the crews, the birds, ple who help you along yo the weather *and the unexpe[cted]* you cannot determine *who* cause factor, then determi[ne] was the cause factor. Mayb[e] where in the future a requiren come along that supervis hard training will be able to plish even the most formi[dable] tasks successfully. (To [be con]tinued). ★

Secretary of the Air Force
SAFETY AWARD
Major Command with a small or no flying mission

AIR FORCE SYSTEMS COMMAND

eneral Alton D. Slay, commander AFSC, pts Secretary of the Air Force Safety Trophy 978 from Dr. Hans M. Mark, Undersecre- of the Air Force. The well-defined and ef- e accident prevention program of the Air e Systems Command fostered achieve- s that reflect a high degree of safety involve- throughout the command. For the second cutive year, the command experienced only Class A aircraft mishap, the lowest number cidents in the history of the command. In on, total Class B aircraft mishaps were re- more than 50 percent, and only one high cost Class B aircraft mishap was experienced in 1978 compared to four the previous year. This record is particularly impressive when considering that flying operations were conducted in a test mission environment featuring one-of-a-kind aircraft, unique aircraft configurations, and missions designed to test the limits of a system's capability. Ground safety accomplishments were equally impressive. On-duty injuries, off-duty fatalities, and Air Force motor vehicle mishaps were each more than 25 percent lower than the previous year, and most categories evaluated were below the Air Force average. ★

OPS TOPICS

ATC FACILITIES TO PANAMA

The FAA will turn over the agency's air traffic facilities and related responsibilities in Panama to the Republic of Panama beginning October 1.

FAA Administrator Langhorne Bond said the transition will be complex and will take five years to accomplish. Present schedules call for Panama to assume full control of the International Flight Service Station (IFSS) by 1981 and the Center and Terminal Radar Approach Control (CERAP) facility by 1983. By October 1 of the following year, the operation and maintenance of radar equipment serving the CERAP will be handed over to Panama along with the responsibility for all other air traffic services provided up to that time by FAA.

CROSS-CHECK

A recent incident in a T-38 reminds us that maybe if we become dependent upon, and complacent with our fancy gadgets, the back-up systems may not back us up. Seriously, the main ADI gyro and standby ADI gyro apparently went TU (tumbling under) at the same time. The crew recovered successfully, but a comment by the instrument technician struck home! "Probably not a premature failure . . . installation dates were 1976 and 1975 . . . most pilots don't cross-check and really monitor the standby enough to notice that it may have been getting sluggish." I plead guilty! Cross-checking and writing up more often may prevent a bad attitude. (Sorry.)

LOADMASTER INJURY

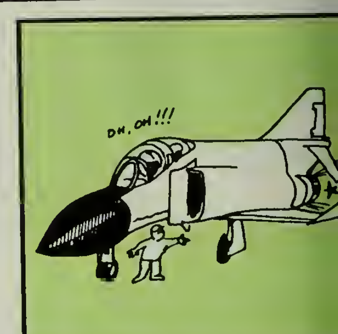
While a C-130 was taxiing in, the load master was preparing for parking. Brakes were not being applied at the time, but the individual somehow slipped and fell to the deck below. Result: broken leg with associated work loss. Could have been worse, but we'd still like to pass on the reminder to *watch your step*. Unless the task absolutely needs doing, it's smart to stay seated and belted until stopped.

PRESSURIZATION PROBLEMS

A recent incident again pointed to the need for timely action by flight crews carrying passengers. A transport aircraft departed a western base and was climbing through FL 330 when pressurization problems were encountered. During troubleshooting of the problem, a rapid decompression occurred. The crew accomplished an emergency descent and returned to their departure base without additional problems. No one was seriously hurt but some valuable reminders can be passed on:

- A timely descent to a non-oxygen altitude should be made (when feasible) because passengers (although well-briefed) may not react quickly or properly to a pressurization problem.
- Don't let complacency set in concerning the checking or "readily available status" of *all* oxygen equipment aboard the aircraft.
- Make your passenger oxygen briefings/demos thorough and that there is no confusion as to lo and use of equipment.
- A crew and passenger "b plan is not a bad idea to prepar possible pressurization problem emergency oxygen cylinder fail ing this incident and the individ saved only because others put an alternate source of oxygen.

As crew members, we p procedures for pressurization gencies. We are also trained in tude chamber to recognize dividual symptoms to prev sidious hypoxia. Passengers have the luxury of this train experience. They depend o pass on the knowledge they and then to operate the machi their well-being in mind.



GULP! FOD

The End of Runway (EO were just trying to do their they pushed a little too har the weapons specs armed t dispensers, one of the aircraf ists, to move things along, op gun bay access door and rem safety pin to arm the gun. A ing the door he started for o weapons specs to hand him But the left engine had ot and sucked it out of his hand all 17 stages of the compres

Secretary of the Air Force SAFETY AWARD

Major Command that flies more than 2% of total USAF Flying Time

STRATEGIC AIR COMMAND

neral Richard H. Ellis, Commander in , Strategic Air Command, accepts Secre- of the Air Force Safety Trophy for 1978 Dr. Hans M. Mark, Undersecretary of ir Force. Strong command support and visory involvement, coupled with profes- adherence to procedures and standards, ed in outstanding safety program effective- hroughout the command. Only one aircraft estroyed, aircraft-related casualties were d to a near record low, and the aircraft mishap rate was the lowest in the long and nt history of the command. This remark- chievement, compiled while flying more ne-third of a million hours of worldwide, strategic operations, is a demonstration of dedication to high standards of excellence. Impressive accomplishments in other safety disciplines complement the flight safety achievements. The nuclear safety mission, largest and most complex in the United States Air Force, was performed in an outstanding manner, reflecting superior unit motivation. The explosives safety mission was accomplished without experiencing a single Class A or Class B mishap. Ground safety accomplishments were equally impressive. The command did not experience a single military or civilian on-duty fatality during the year, and off-duty fatalities were nearly 25 percent less than the previous year. ★

The Well Dressed Man

MSgt James A. Patterson, Jr.
36th Tactical Airlift Squadron
McChord AFB, WA

"Aw, Sarge, do you mean we gotta wear this nomex underwear under our flight suits all the time? You know how hot these nomex flight suits are in summer and how cold they are in the winter! What good are they anyway, huh?

When we fliers started receiving our first issue of nomex underwear, how many times did you hear similar statements like the one above? Quite often, I'm sure. I've heard it myself many times. As a matter of fact, the same thoughts went through my mind, plus, it's another piece of clothing to account for, take care of, and to carry for mobility.

I guess everyone had his own thoughts about nomex, and most of those thoughts were on the negative side. Remember when the nomex flight suits were first issued? Everyone tried to hang on to the old K2-B flight suits until the very end. Some people had to be ordered to wear the new nomex. When the new nomex flight suits were washed for the first time, remember how they used to get all those little lint balls all over them? Then, the seams would come apart and there would be a million loose threads. After they were washed a few times, you could almost see through them. Maybe that's why we heard that they lost their resistance to flame and heat. Of course, we've all been told how expensive nomex is. Uncle Sam had been taken again! How could the Air Force expect us to wear these flight suits and maintain a good military image?

The nomex flight suit has come a long way since its first issue. Today, the seams are holding better and the little lint balls are gone. The material seems to be a little heavier and warmer in cold weather. With these improvements, I think the nomex flight suit is a lot better looking than the old K2-B flight suit. Plus, now we've got nomex underwear, gloves, and both winter and summer weight flying jackets.

Experience is the best teacher, so to answer a couple of these questions about nomex, I'd like to pass mine on to you. Maybe I can save you from some of the discomforts and pain that I've been through.

Being a hunter and fisherman, I've gotten a lot of use out of my underwear. As a lot of you wil it didn't take long to find out nomex underwear is not only and more comfortable to wear, just as warm as the old woolies transited arctic bases with t atures of 70° below, and hu temperatures down to 10° belo ing. These nomex underwe keep you as warm as any oth of long john.

First of all, no one is g criticize you for not wearin nomex underwear in hot or eve weather. If I were preflighting ing my airplane in warm we wouldn't be wearing mine But, would you have a pair w Probably not, but you ca month's pay that I'll have mi me. I have a pair in a plas packed in the outer pockets of met bag, all the time.

During our last ORI, our c selected, and put through 2 ni 1 day of Escape and Evas Survival. After completing ou equipment airdrop, without ar ing, we were hustled off, re

briefing then found ourselves
the middle of the Nevada desert.
next 36 hours would be very
sting; the only things we were
ed to take were items we carry
our professional gear. We had
ng but flashlights, our gloves,
eavy equipment safety line and
ple of knives. We were given a
a compass, 1 gallon of water,
ordinates of our safe area and
proximate location.

six of us took off in the direc-
f our safe area. By daybreak,
d reached the foothills of a
ain range where we could safely
E to our safe area. That first
wasn't too bad, except for an
onal break, because we were
ually moving. At first, our map
wasn't what it should have
nd we headed in the wrong di-
. As a matter of fact, we made
mistakes at the start. I think
s probably due to the situation
ddenly found ourselves in, the
ss and the cold. However,
ve stopped for a break, believe
was cold. Our only clothing
r nomex flying suits, and sum-
ing jackets. What a relief when
came up!

we found out where we were
aded in the right direction,
of the day was great. We were
ding in our E and E; matter of
one time, we became the ag-
s. At least, that's what the
ors thought. Even though they
he area we were in, they
find us. They had crept into
ition, but we spotted them in
ur evasion at that time was not
pposite directions, but in the
n of their vehicles. Even
we turned and headed for
safe position, the aggressors
we were moving to capture
ck, causing them to retreat to
n area as fast as they could

ept them in sight all day and,
ing their position and moves,
r E and E to the safe area
ccessful. However, too soon,
came to an end. With dark-
e the cold and freezing desert
wind. Our E and E gave way to a much greater need—SURVIVAL! Our light summer flying clothes were no match for the freezing night wind of the desert. Even though we built a wind break, we had to build a fire, too. None of us slept, we took turns gathering firewood all night long. Around 0300, we built a second fire within our shelter and huddled between them. The one thought that went through my mind all night besides praying for the sun, was wishing I had a pair of nomex underwear. At that time, even there in the Nevada desert, I'd have given $100 for a pair of them.

If the aggressors really wanted us, they could have taken us at any time during the night, without much trouble. If it were an actual situation, right now I'd either be a POW or dead. Eventually, the sun came up and again the heat of the day. We were picked up and the exercise terminated. Although I had many thoughts of packing a pair of nomex underwear with my professional gear, I still had not learned my lesson. In less than a year later, I learned the full value of nomex.

Before hunting season opened this year, I purchased a new pair of hunting pants, named "Brushbuster Pants," from Sears. They were made of 100 percent cotton duck with a vinyl covering on the front of the leg up to the crotch, and a vinyl covering on the back, covering the calf. The vinyl is for resisting snags in brush. The pants also had a nylon lining in the seat for waterproofing. For hunting here in Washington, these pants really seemed to be ideal. However, they were missing one thing—a label stating: WARNING-FLAMMABLE CLOTHING.

The opening week of elk season, my buddies Mel Rae, Dick Ring, and an old friend George Rath, were camped in the Wenatchee Mountains. Most of the week the weather had been clear, a little windy, and mild. The hunting wasn't as good, we had only seen several cows. Thursday evening the weather had turned cold and windy, and by Friday morning we had an inch or two of snow. On Friday Dick, Mel, and I hunted near the top of the mountain; George

hunted near camp. After the day's hunt, we drove back to camp, finding George had already built a good campfire. On top where we had been hunting, the temperature was approximately 9°F, but back in camp, it was around 20°F. The wind was blowing about 10 to 15 mph. It was COLD. The campfire was a welcome sight. By 1830, I had finished eating, cleaning up, and was back outside to the campfire.

Dick and George had just left to visit some friends in the camp above us; Mel was still in his camper eating. I stood about 3 to 4 feet from the fire facing it, and after several minutes I turned around to warm up my back. After several minutes with my back to the fire, my left leg started to get warm, so I took a step away from the fire. Instead of cooling down, my leg continued to get hotter. I turned my head and saw a small flame on the back of my left leg, below the knee. I reached back with my left hand and slapped the flame two or three times. After the second or third slap, I realized two things: one, my left hand was burnt and, two, the flames were getting bigger. I dropped to the ground in a sitting position, and rolled my legs attempting to smother the flames. This did not work either. As a matter of fact, the flames were getting bigger, and now my right leg was also on fire. Realizing this dangerous situation was getting worse, and I was already burnt, I called for Mel. At the same time, I unbuckled my belt, and pulled my zipper down trying to get those blazing pants off. I couldn't get the burning legs over my hunting boots. Mel had come to the door, and seeing me ablaze, he grabbed an empty duffle bag, jumped out and wrapped it around my legs, pounding on it several times in an attempt to smother the flames. This did not work either so Mel threw the duffle bag aside. I was a human TORCH. Mel then took his hunting knife and cut the pants off my legs.

What seemed to be an eternity, actually happened in approximately 3 to 4 minutes. Mel helped me into my truck, sprayed my burns with a first aid spray, then went after Dick. Dick and Mel returned, and after giving me first aid, Dick drove me to a hospital, 13 miles away. I was treated for shock, and second degree burns of my left hand and leg, kept overnight, and released the next afternoon. Monday I reported to the flight surgeon and was sent to the hospital. I was kept for 8 days, then given 4 weeks of convalescent leave, readmitted for 4 more days then given 13 more days of convalescent leave. This is my last week of convalescent leave, my hand has healed, but the burns on my left leg are still not quite healed. It's really leaving quite a scar, but the pain has been indescribable.

Besides having a buddy who risked great harm to himself, receiving severe minor burns of his own, and another knowing first aid, I was also wearing my nomex underwear. This time I had them on when I needed them.

Picture a man sitting on the ground, both legs completely engulfed in flames for 3 to 4 minutes, flames leaping about a foot in height. You will probably expect 40 to 50 percent of my legs were burned. Mel, who had witnessed the fire with me, when he saw my legs exclaimed, "Is that the only place you got burned?" After seeing what was left of my hunting pants, Dick made a similar statement. However, only my left leg received serious burns, and probably not more than 10 to 15 percent of it. My right leg also had several minor burns which I didn't notice until 3 or 4 days later. By that time, the minor burns were just about healed and never needed attention.

The serious burns, I believe, were caused by the molten vinyl sticking to the nomex. If the molten vinyl had not stuck to the nomex, I would probably be well and back on flying status at this time.

I've still got the nomex underwear, just as they were after the fire. Besides being soiled and the vinyl still stuck to them, there is little else with them. If I can get the vi I may be wearing them aga year. Another point that I feel be made is: the nomex unde was wearing is 4 or 5 years has been washed many, many It has not lost its resistance One thing that amazed a lot medics and nurses was, even received the second degree the hair on my leg was n scorched. The flames did through the nomex. Nom proven itself to me.

As fliers, we should always to be caught by the unexpect Boy Scout Motto tells it bes Prepared." Not only does the dictate the wearing of our underwear, but so does our j work in an environment wh risk of fire is very great. This i both ground and inflight dutie there is the thought that non ever likes to think about, C If you've been paying attention Flying Safety Meetings or w the news, you already kno have been far too many crashe the last year. I wonder how ma survived a crash but perished fire that followed? I'll bet if w the actual numbers, we'd all lot more respect for fire.

One thing I am very certa DON'T EVER WANT T BURNED AGAIN. If I a killed in a crash in a hot clim body will be easy to identi probably be the only one with underwear, either under or flight suit. But on the other h cause of my nomex, I may only survivor. The next time my nomex, whether in a tra actual situation, I'll be pre have mine with me, do y yours? ★

ABOUT THE AUTHOR

Sergeant Patterson is an Chief and Instructor Loadm C-130 aircraft.

TATES AIR FORCE

Vell
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CAPTAIN

KENNETH L. STANFORD

9th Strategic Reconnaissance Wing
Beale Air Force Base, California

On 26 June 1978, Captain Stanford was flying an overseas operational U-2 high altitude reconnaissance sortie. After one hour of flight, Captain Stanford retarded the throttle slightly to adjust the engine EGT. Throttle movement resulted in no corresponding movement of engine instruments. Further throttle movement proved equally ineffective. With the engine now operating above maximum EGT limits, Captain Stanford found himself with a runaway engine which could only be shut down by activating the emergency fuel shut-off switch. A check revealed that all normal alternates were IFR. Captain Stanford headed toward the nearest VFR base, which was several hours flying time away. By this time the EGT was considerably above maximum limits and Captain Stanford was faced with the decision of descending to a lower altitude to reduce EGT but consume more fuel, or to maintain his altitude to conserve fuel but risk further possibility of engine damage. Because the nearest VFR base also had crosswinds within one knot of U-2 landing limits, the possibility of further diversion had to be considered. Captain Stanford chose to remain at altitude and save fuel. Upon arriving over his first recovery base, Captain Stanford discovered the winds had abated slightly and decided to remain there. After holding for several hours to permit a recovery team to be assembled, he shut down the engine and began gliding down for a "deadstick" landing. Passing FL 280, Captain Stanford attempted to configure the aircraft for landing, but discovered the hydraulic system would not function properly. Realizing that a no-flap flameout approach to a strange runway in a strong crosswind would be extremely hazardous, he elected to attempt a restart to get sufficient hydraulic pressure to properly configure the aircraft. During the restart, the EGT again went out of limits, but allowed him to get the flaps down and reset trim before he shut the engine down again. Maneuvering between buildups and low clouds, Captain Stanford made a flawless flameout pattern and landing. The timely and decisive actions of Captain Stanford under sensitive operating conditions and with marginal weather prevented possible injury or loss of life to himself and resulted in the safe recovery of an extremely sensitive and valuable reconnaissance aircraft. WELL DONE! ★

NEWS FOR CREWS

Information and tips to help your career from the folks at Air Force Military Personnel Center, Randolph AFB

Major Gary E. Wallace
Rated Officer Career Management Branch • Air Force Manpower and Personnel Center

FAIP/Other Assignments

The FAIP/Other assignment process is the method by which follow-on rated assignments for ATC's First Assignment Instructor Pilots (FAIPs) and "Other" non-major weapon system identified pilots are determined. The basic intent of this process is to provide every FAIP/Other the opportunity for major weapon system identity, thereby maximizing downstream career opportunity and optimizing utility within our pilot requirement structure. The process has been in being for nearly five years, with the major variable being the relationship between the number of folks "on the market" and the availability of major weapon system training. The latter is determined by training budgets, RTU/CCTS capacity, and the capability of the various weapon systems to absorb FAIP/Others in addition to UPT graduates. These considerations have caused training opportunities to vary substantially, from a low of 10-15% in FY76 to 100% in FY79.

The process is managed by the Rated Officer Career Management Branch at AFMPC, with the Trainer Assignment Section having administrative responsibility. Assignment packages are worked six months prior to an officer's available date (DEROS, Rated Supplement completion date, IP tour completion date, etc.), and aircraft of assignment are generally released the first Friday of the fifth month prior to the available date. For example, an officer available in December would be worked during June. The release date for his aircraft of assignment would be the first Friday in July.

The process is competitive in nature, based on a comprehensive evaluation supported by a complete career brief, an OER file, a current AF Form 90, and any pertinent correspondence relating to the officer. The career brief contains the bulk of an officer's stored personnel file. The primary items used in the assignment process are duty history (emphasizing job title, level, and performance – OERs), rated progression, and flying time. This information is supplemented by a thorough review of each officer's OER and correspondence file to extract additional indications of job performance, other duties, awards, education, and recommendations. Based on this composite data, the entire monthly package is rank ordered – the most difficult step of the process. This ranking is reviewed by a board representing the needs and interests of every operational MAJCOM, and chaired by the Chief of Rated Officer Career Manageme realize the weight of our decision, and fully ap that our board action may well determine the area of endeavor for each officer during the re of his career. We do not take this responsibility

As stated, during the formulation of the packa officer's correspondence folder is reviewed and tinent correspondence is included in our de tions. As a minimum, this includes his latest F but often also includes letters of recommendatio ters documenting items not included in OERs sonnel records. Such attachments can effective plement the selection process provided they ar tive, factual, and consistent with other data. If t nothing of substance to the officer's duty hi OERs, or are in obvious conflict with other da out explanation, they are somewhat superfluou process.

Unless forced to by unusual circumstances, ply will not work an officer's assignment with rent Form 90 information. We feel that no game be played with the Form 90, and every block remarks should "tell it like it is!" A workab 90 – one that helps both you and us – is differe FAIP/Other than for a major weapon system i pilot, in that the former is competing for initial system identity rather than seeking a particular j in a major weapon system world. We requ the FAIP/Other list weapon systems in his prior until he reaches a point where he no longer has ence. Eighty-nine choices are the maximum we've seen! This may be overkill, but it's be underkill. A comprehensive listing helps us be sive to you no matter where you rank in the to age. Geographic preferences can also be wo long as you define what you want and give pr within the defined area. A supplemental prio ing of aircraft is appreciated and often usefu event the geographic preferences are not a Also, any remarks that you feel might be releva assignment process should be included. Help the best we possibly can for you!

The monthly package is now a carefully rank group of competitor's records, each with a Form 90 and pertinent correspondence attach next step is determining the assignment (aircr supplement DAFSC, etc.) for each individu

training allocations are made in annual blocks, h are further broken down into monthly quotas sponding to the number of available candidates. xample, if 10 percent of the projected availables e year are in a monthly package, then roughly 10 nt of the annual training allocation for each on system will be assigned that month. This od of distributing training equalizes opportunity lless of when an officer becomes available during ar. Figure 1 shows the FY79 annual training allo- for FAIPs and other available pilots without weapon system experience.

FY79 FAIP/Other Training Distribution

/Recce/Intcp		Bomber/Tanker		Airlift/Helo	
-4	114	B-52	20	C-130	32
-7	21	FB-111	6	C-9	11
-10	57	KC-135	66	C-141	107
15	79		92	C-5	40
111	24			C-140	4
-4	12			C-135	3
tcp	19 (1)			WC-135	1
C	36			Helo	32
	362				230

52.9% - Ftr/Recce/Intcp
13.5% - Bomber/Tanker
33.6% - Airlift/Helo

-33/EB-57/F-106

Figure 1

a monthly breakout of assignments, aircraft gned to the rank-ordered package based on qual- and Form 90 desires. If the top officer in the is qualified in accordance with AFM 50-5 re- nts, he gets his highest "available" Form 90 The F-16 is currently a frequent top preference; r, it won't become "available" to the FAIP/ ategory pilot until operational squadrons begin ert. If the first preference of the highest ranked were an F-16, we would therefore have to skip o to his second choice, etc., until we came to est currently available preference. If an officer t qualified for fighter training in accordance M 50-5 and yet fighters were his top nine his tenth choice would be the highest to which possibly assign him. As aircraft are assigned, ally desired weapon systems allocated to that re taken and no longer available to the re- officers. Hence, there are three primary fac- affect an assignment: (1) the officer's qualifi- r training, (2) the rank ordering of the pack- (3) the personal preferences of officers who er in the package. The interplay of these fac- es it impossible for us to predict an officer's assignment — something we're constantly asked to do. As outlined above, the highest ranked individual could get his tenth choice, and the lowest ranked officer could get his first choice — it's relative not only to ranking, but also to the preferences of all the other officers in the package.

Once the aircraft assignments are made, the package is distributed to the various weapon system resource managers, who will then work with the officer to determine the end assignment and training sequence.

In summary, we view the FAIP/Other follow-on assignment process as a vital part of the overall USAF rated officer management scheme. The vast majority of our rated requirements are designed to be filled with officers with a solid major weapon system foundation. From another perspective — that of the officer himself — failure to establish that foundation at a relatively early stage in his or her career could lead to problems downstream. If you doubt that last statement, talk to any of the FAIPs reassigned directly to supplement duty in the drawdown years of 1973-1976; many are facing "green bean" status in operational squadrons today as senior captains or even junior majors. This challenges both the individual and his unit. It's something we think we can avoid in the future by systematically ensuring available training for our FAIPs as they complete their initial tours in ATC.

Taking several recent management initiatives into account, it looks like that 100% training opportunity we (and you) are enjoying today will be with us through 1984, which is the end of our current planning cycle. While things could change between now and then, this is a much improved picture over what we foresaw just a year or two ago. FAIP/Other training is an important investment for the Air Force, and remains high on the list of rated management priority issues.

That's where we stand today — what we're doing, why we're doing it, and how it's being done. Our commitment to you — the individual — and the Air Force is to keep the process unbiased, fair, and responsive. Your two direct links to this process are: (1) through your CBPO, by keeping records and Form 90 up-to-date, and (2) through us here at AFMPC. You play a big role in this process, so give us a timely note, call or visit to discuss that role: AUTOVON 487-6124/5 or AFMPC/MPCROR6, Randolph AFB TX 78148. ★

ABOUT THE AUTHOR

Major Gary E. Wallace is Chief of the Trainer Assignments Section at AFMPC. He is responsible for all ATCIP assignments, to include follow-on assignments to major weapon systems. Major Wallace's background includes tours in the F-4, T-41, T-37, and T-38.

When I Fly Into Cold Climates, I Always Wear My
CWU-43/
CWU-44/
NOMEX
SUPER SUI
The Recommended USAF Undergarments for Cold Temperatures.
(Cape and chest emblem NO
USAF
POW
CHECK THESE OUTSTANDING FEATURES
Same cold weather protection as the popular cotton models.
Waffle-weaving allows normal body "breathing".
Stretch action capability for full comfort.
Made of fire resistant NOMEX material.
Warmth retaining mock turtle-neck, wristlets, anklets and elastic waistbands.
Completely machine washable.
Comes in five sizes to fit all heroes.
(Heroine models to be available soon.)
USAF LIFE SCIENCES APPROVED
This product has been awarded the official USAF Life Sciences Seal of Approval
ANOTHER FINE PRODUCT OF YOUR AIR FORCE
PROCUREMENT SYSTEM
A WHOLLY OWNED SUBSIDIARY OF THE UNITED STATES GOVERNMENT

AEROSPACE

SAFETY • MAGAZINE FOR AIRCREWS

MAY 1979

THE WAY IT WAS — complacency revisited

BE THE BEST — a professional look at professionalism

HOW HIGH IS YOUR ENDURANCE? — how long can your flight endure?

DUCKING UNDER: — performance and prevention

THE PROFESSIONAL APPROACH

Air Force Communications Service
Scott AFB, IL

Recently a Hazardous Air Traffic Report (HATR) was generated concerning the "TACAN or ILS/DME Rwy 15" approach procedure for Maxwell AFB (right). The problem stemmed from the application of the 800 foot restriction for DME equipped aircraft. In the procedure, an aircraft with DME is restricted to 800 feet at 3DME, a step-down-fix (SDF), but without DME can go down to 640 feet (LOC minima) anywhere between the Final Approach Fix (FAF) and the runway threshold. To the pilot this restriction seems confusing and, at first glance, there doesn't seem to be any reason for it. Though there are very few approaches with this type of restriction, we feel an explanation is in order.

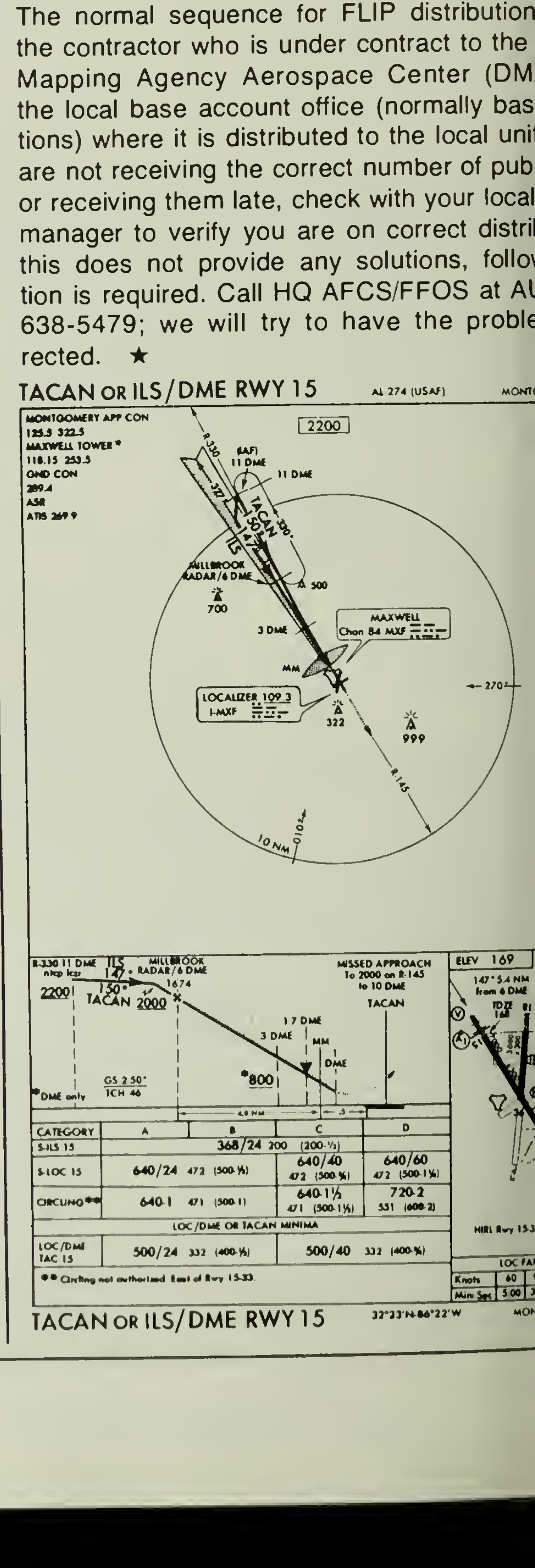
Under most circumstances, a step-down-fix altitude will appear as an MDA if the SDF is not received. The SDF/MDA altitude is usually due to an obstacle in the final approach segment between the FAF and the SDF. Thus, if the SDF is not received, there is no way to identify obstacle passage and the MDA will be higher. Of course, if the SDF is identified, a lower MDA will be authorized. In the case of the TACAN or ILS/DME Rwy 15 for Maxwell AFB, the SDF is only applicable to DME equipped aircraft and the altitude is higher than either the TAC or LOC MDA's. The reason, in this instance, is a combination of descent gradient and obstacle clearance. The descent gradient for this type of approach, according to the Terminal Instrument Procedures (TERPs) manual, can be no more than 400 feet per nautical mile in the final approach segment. The TERPs manual also states that neither the gradient from the FAF to the SDF, nor the gradient from the SDF to the runway threshold, can be more than 400 feet per nautical mile. The 800-foot altitude at 3DME is the lowest altitude that can be published and still comply with the intent of AFM 55-9 (TERPs). It results in a descent gradient of 400 feet per nautical mile between the FAF and the SDF. An altitude of 640 feet at the SDF could be used for obstacle clearance, but this would result in a descent gradient of 453 feet per nautical mile between the FAF and the SDF. If an aircraft is not DME equippe[d] only descend to LOC minima and there is [n] for a SDF. Descent gradient in this case is between the FAF and the runway thresh[old] sulting in a gradient of 339 feet per nautical

In an effort to reduce pilot confusion w[ith this] type of SDF, action is being taken to sepa[rate] TACAN and ILS approaches for Maxwell a[nd] bases. There still remains, however, some F[LIP] host nation procedures with this type of re[striction.]

FLIP DISTRIBUTION

In the past, several units have had prob[lems re]ceiving their FLIP products on time. In additio[n] have had problems receiving the correct The normal sequence for FLIP distribution the contractor who is under contract to the Mapping Agency Aerospace Center (DM[AAC)] the local base account office (normally bas[e opera]tions) where it is distributed to the local uni[ts. If you] are not receiving the correct number of pub[lications] or receiving them late, check with your local manager to verify you are on correct distri[bution. If] this does not provide any solutions, follo[w-up ac]tion is required. Call HQ AFCS/FFOS at A[UTOVON] 638-5479; we will try to have the proble[m cor]rected. ★

TACAN OR ILS/DME RWY 15



TACAN OR ILS/DME RWY 15

ED STATES AIR FORCE

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SAFETY MAGAZINE

1979 AIR FORCE RECURRING PUBLICATION 127-2 VOLUME 35 NUMBER 5

page 2

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SPECIAL FEATURES

REGULAR FEATURES

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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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It was a bright, crisp, June morning, nearly 26 years ago, when the F-51D Mustang roared off the asphalt runway for a typical ADC solo training mission — practice GCI letdowns, GCI intercepts, practice aerobatics and another look at the New England countryside.

"What a great way to earn a living," thought the second lieutenant as he took his Mustang through a series of barrel rolls, Immelmanns and eight-point aileron rolls — the latter particularly suited to the aircraft's big, effective rudder and the pilot's long legs. He really felt good in the airplane, with a year of experience since graduation from aviation cadets and 700 hours of total time — over 400 of it in the 51. And, he had been flying a lot lately.

The lieutenant also felt that he had the confidence of his unit supervisors. He had recently qualified as expert in air-to-air gunnery (firing on the rag) and had been upgraded to element leader. He had recently led a flight of two Mustangs on a weekend cross-country. His ops officer had advised, "I don't care where you go on your trip, just have the airplanes back for 0730 Monday morning." The lieutenant had made it back with 5 minutes to spare.

There was no doubt that the lieutenant had a high degree of self-confidence. In fact, he thought he was the hottest fighter pilot since Dick Bong. Little did he know that he would soon be involved in a major aircraft accident that would burst his bubble and influence his future career plans.

The lieutenant really enjoyed this kind of "lone wolf" mission, where he could do whatever he wanted to do for 2 hours, with no supervisor. In the winter, he would buzz the ski slopes and the ice shanties on the lake. This time of year it was the swimmers on the beach, the sailboats, and the prisoners on their exercise break down at the Federal Penitentiary. The greatest sport was to hang and wait for a fellow squadron member to come up, bounce him, and mix it up in a mock dog fight.

Today, however, was rather dull. Nobody came up to challenge his dominance of the skies, and the crosswind prevented his flying under the bridge today. No use taking chances.

The fuel gauge and the clock indicated time to land. The lieutenant made his split-S le entered traffic and pitched o 360-overhead pattern. On downwind, he went through GUMPF check — Gas (fulles selected), Under-carriage (g down), Mixture (full forwar (set for go-around rpm), and (full down).

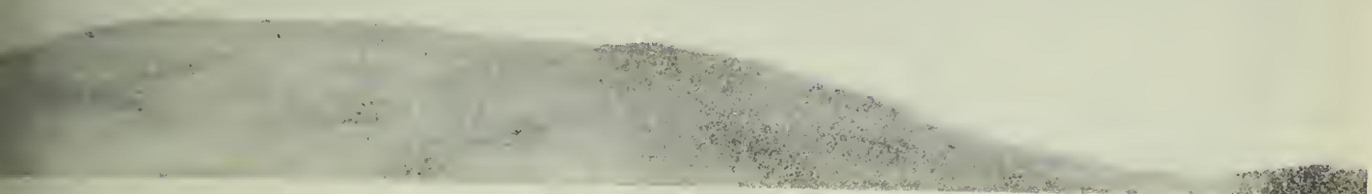
But HOLD IT! The landi is not indicating "in the gre problem. Check the bulb — Hydraulic pressure — fine, 1 No warning horn. Just a ba

Turning final, the lieuten mobile to check his gear as by, as a precaution. He add power, floated past mobile feet in the air, got a "looks from mobile, and flared out touching down a few hundr past the mobile unit.

He allowed the aircraft t down by rolling straight ah few thousand feet, realizing was going too fast to make turn off the runway at the t to the Air Force area. After few hundred more feet, app brakes, he elected to do a l degree turn and return to th taxiway. He moved the stic forward to unlock the tailw full swivel and applied righ

THE WAY IT WAS
Complacency Revisited

Richard A. Rung • Directorate of Aerospace Safety



rt the turn.
en it happened. The aircraft
a mild groundloop to the
and the pilot countered with
rake in an attempt to regain
ol. The aircraft turned right
ly through 90 degrees, nosed
nd struck the propeller on the
ay. The plane then settled back
ly on its tailwheel. The
ge: Substantial. Three prop
bent, sudden stoppage of the
, and wrinkles in the fuselage
the radiator. Total cost for
$21,476, including 120
urs of labor – $360. The pilot
ot injured.
accident investigating board
good job in identifying the
rror:
ding 1. The pilot used poor
ent in estimating his taxi
and prematurely unlocked his
eel causing him to lose
onal control of his aircraft.
ding 2. The pilot misused his
in that he applied excessive
re, causing the aircraft to nose

ommendations:
ot review all existing
ves covering all phases of
and ground handling of the
.

2. Continued emphasis be placed on the need for constant supervision in maintaining the above mentioned discipline.

The board did a good job – *as far as it went*. Today, under the all-cause system of assigning causes to aircraft mishaps, investigating boards are instructed to probe deeper for root causes and try to answer the question: "Why?" "Why did the pilot err?" Under this system, any deficient act, omission or condition, which, singly or in combination with other causes contributed to the mishap, and which, if corrected, eliminated or avoided could have prevented the mishap, would also be designated as a cause. Boards also look closely at human factors to determine if any of these influenced the pilot's actions.

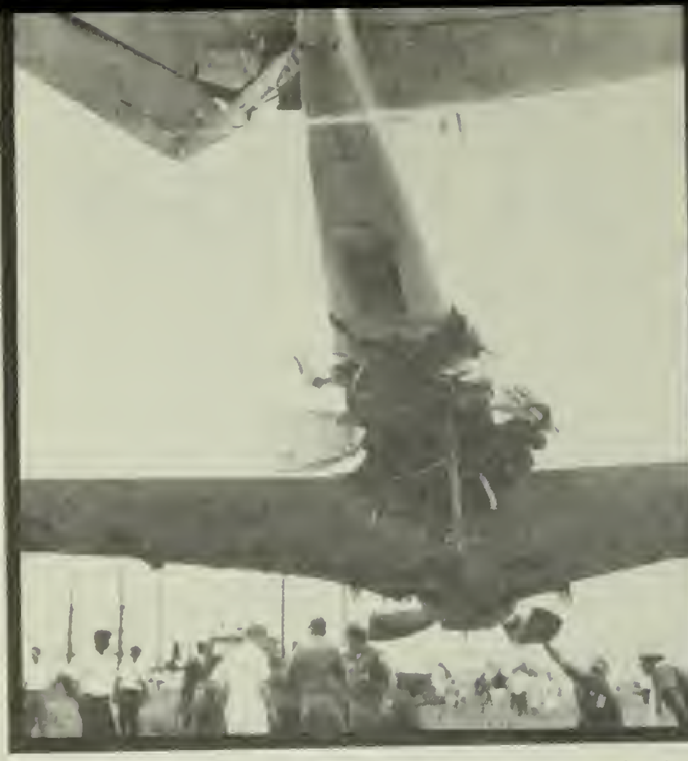
Deep in the catacombs of the Air Force Inspection and Safety Center's repository for aircraft mishap reports, this F-51D mishap report was discovered on microfilm. The old Form 14 (today's AF Form 711) revealed some enlightening facts:

First pilot time:
- last 90 days – 208:50
- last 30 days – 85:00
- last 24 hours – 8:50

Board testimony also revealed that the pilot had been on ADC alert for the 24 hours preceding the flight, had been relieved from alert, and had proceeded directly to his aircraft for start engine. Takeoff was at 0730 and the mishap occurred at 0930. While on alert, he had flown six missions, logging 6 hours and 50 minutes, including 3 hours and 5 minutes of night time, landing at 2350 the night before the mishap.

The board members were apparently concerned about crew rest, but didn't draw any conclusions or make any recommendations. Board testimony went like this:

Q. What time did you get up?
A. 0630.
Q. Had you flown the night before?
A. Yes. Three hours and 50 minutes. All night time. Landed at 1150.
Q. How much sleep had you had the night before?
A. From 1230 'till 0630 – 6 hours.
Q. Do you feel you were under any undue stress because of fatigue brought on by previous work commitments?
A. I believe that there is a factor there – that a man may



They used to say "any landing you can walk away from one." That's what they used to say. We don't say th

feel alert and not tired, but there may be a subliminal fatigue. As far as I was concerned, I wasn't tired at all that morning, but as I said, it may have been a factor.

Q. Do you often fly 8 hours and 50 minutes a day in the Mustang? Is that squadron policy?

A. As far as I know, there is no limit as to how many hours a pilot can get in a day.

The commanding general of the Eastern Air Defense Force, in his through-channels indorsement, also expressed concern over the pilot's excessive flying time – specifically the 85 hours in a 30-day period, stating, "possibly this may have had an indirect bearing on the accident." He directed that all pilots and supervisory personnel be alerted to the "possible detrimental effects of excessive flying, particularly among newly rated pilots with a natural desire to accumulate flying time."

This mishap undoubtedly was one of many which influenced Air Force managers in establishing the crew rest and flight duty limitations now found in AFR 60-1, Chapter 7. Under today's rules, the pilot would have to be afforded a minimum of 12 hours crew rest, including time for 8 hours of uninterupted rest, beginning at the termination of his flight the night before the mishap.

Today, the Directorate of Aerospace Safety, in assigning cause factor categories, would identify both pilot factor and supervisory factor for the crew rest violation. The rationale is that pilot fatigue, due to inadequate crew rest, contributed to the mishap. Pilots are responsible for compliance with the minimum requirements of the crew rest regulation. In addition, unit supervisors must ensure compliance with the crew rest provisions and flight duty limitations of the regulation.

Another factor which would be highlighted in today's investigation of the mishap is the human factor of complacency. The pilot taxied too fast and prematurely unlocked his tailwheel, probably due to complacency. His 200-plus hours in 90 days, 85 hours in 30 days, and 8 hours and 50 minutes in the last 24 hours made him overconfident and complacent in his handling of the aircraft during a critical phase of flight. He stopped "flying" the aircraft because it was in the chocks.

A human factor which was not explored by the board was habit pattern interference. During the week preceding the mishap, t had been checking out in a T preparation for the unit's tran to F-86's. He had flown three sorties, logging 5 hours, mos the landing pattern. The heav braking required in stopping T-33 was in direct contrast to cautious braking associated w nose-up potential of the F-51 pilot applied excessive brake pressure in attempting to rega control of the aircraft, probab to habit pattern interference.

Today, as a result of Air F managers' recognition of hab pattern interference hazards, simultaneous qualification in different types of aircraft is substantially curtailed. This l factor has been identified in related to the accelerated cop enrichment (ACE) program.

Needless to say, Air Force regulations, supervision and leadership have developed to today where most of the "lo wolf" missions of days gone never get off the ground. The reduction in mishap rate sinc days is a reflection of sound management and mature lead

Those were fun days, but can't afford to allow our pilo have that kind of fun today 10 million dollars per aircraf

NEWS FOR CREWS

Career information and tips from the folks at Air Force Manpower and Personnel Center, Randolph AFB, TX.

Major Jim Hobson
Chief, Departmental/Joint Career Management Section

'ARTMENTAL/Joint Opportunities

)r rated officers seeking responsible positions in high-l policy drafting and decision making activities, IPC's Rated Departmental/Joint Career Manage-t Section may have a challenging job for you. This e is tasked with providing outstanding pilot and gator manning support to those activities of critical ortance to the Air Force and the Department of De-e. Departmental and Joint manning activities exist ighout the defense establishment including: Air Force ions above MAJCOM level, as well as joint, com-l, allied, and Secretary of Defense staff billets. AFR 0 (the officer assignment reg), Chapter 9, provides of these activities, which include among others, the Staff, White House, JCS, OSD, SAF, Readiness mand, NATO, SHAPE, EUCOM, UN Peace rvers, PACOM, and the MAAG and Mil Groups.

e sensitive mission and far-reaching impact of these ities warrant specialized manning consideration. e levels utilized by the various agencies manned by include senior captain through lieutenant colonel vacancies occurring worldwide. Typically, these ons become vacant due to an officer's completion of trolled tour, promotion to colonel, assignment to in-ence PME, or reassignment to higher levels. Re-nents exist for officers from all rated backgrounds. our job we constantly seek rated officers with strong tional and staff credentials, as well as those pos-g experience or education in specialized areas such erations research, computers, and research and de-ment. Strong writing and briefing skills are uni-ly requested by using agencies.

v some specifics of how individual rated officers entified to fill a Departmental/Joint requirement. All officers entering the assignment cycle as either avail-(DEROS, stabilized tour completion, rated supple-tour completion, or graduation from intermediate ior service school) or eligibles (three years time on and completion of six of twelve-year gate) are ed for possible placement in this arena. If a require-exists which cannot be filled from among officers assignment cycle, computer supported searches are undertaken to identify an officer meeting the qualifications. After a careful review of the officer's entire record, the Departmental /Joint career management team selects the individual officer for nomination and/or assignment against a specific requirement.

Many of the same factors influencing a normal assignment of a rated officer are considered in making a Departmental/Joint assignment. An individual's personal desires, rated expertise, and "gate" status all get consideration. Volunteers are certainly preferred, and a Form 90 indication of a desire to perform duty in the Departmental/Joint arena could well result in the most challenging job of your career. However, overall duty performance is the key to progressing into these high-impact positions. Top performers create demands for themselves by building strong records as aircrew members starting at the flying unit level. Professional military and advanced education, with some demonstration of ability to handle higher level duty, could be influential. However, basic duty performance is still the most important criteria. As advocated by AFMPC resource managers, "PERFORM WELL IN YOUR PRESENT JOB," is sound advice for military officers.

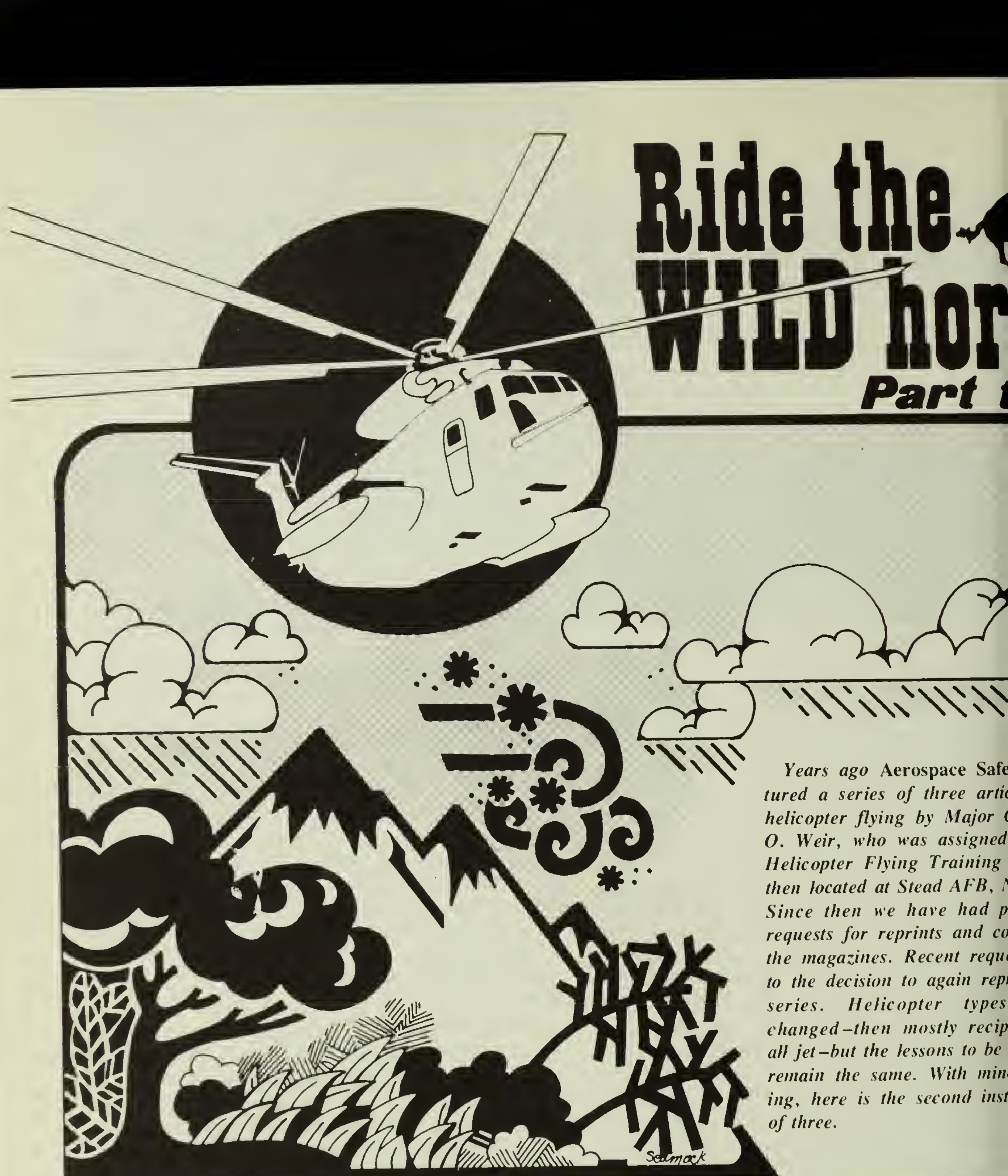
Overall, Departmental/Joint positions offer a high-visability challenging environment loaded with difficult yet rewarding opportunities. Awaiting those officers with a demonstrated superior performance capability are virtually unlimited personal and professional growth avenues of highest impact to the USAF and the nation. ★

ABOUT THE AUTHOR

Major Hobson is the Chief, Departmental/Joint Career Management Section at AFMPC. His previous assignments have included flying C-130B/E/H aircraft in Tactical Airlift, Systems Command and Special Operations.

Ride the WILD hor

Part t



Years ago **Aerospace Safe**
tured a series of three artic
helicopter flying by Major C
O. Weir, who was assigned
Helicopter Flying Training
then located at Stead AFB, N
Since then we have had p
requests for reprints and co
the magazines. Recent reque
to the decision to again repr
series. Helicopter types
changed–then mostly recip
all jet–but the lessons to be
remain the same. With min
ing, here is the second inst
of three.

Major Charles O. Weir

Imagine, if you will, one of your troops hunting. He has been injured at the 8000-foot level in rugged, jagged mountainous country. Send for a chopper! It's that simple; the chopper goes up, retrieves your boy and safely brings him home.

Not so fast! Let's ride along and see what this chopper guy does. If he is on alert, gross weight, amount of fuel, temperature, local winds and the power to hover charts have already been studied and filled out as far as possible. The bird has already been preflighted. It's cocked and ready to go. When landing altitude is known, one more check charts to see power available altitude and you're on your w

As the chopper starts its cli may wonder, why the clinb r wants altitude before he get Why is he looking and scann tinuously? May have an eng

ıre. The bird only has one, and it's ;ood to know the precise spot he will et it down in. Finally, you get there ınd spot the injured party. The chopɔer flies around and around. Why loesn't he just go in and land? There's a good spot! Could be that e is checking for wind, slope, angle, scape routes (both for landing aproach and takeoff paths), size of the rea (bushes, trees, boulders, and anyon walls can tear the blades off), hecking the temperature and altiıde, and finally, he performs a power ıeck.

When he starts his approach, he nothing less than ready. He knows e can hack it. After landing, you ɔtice a large hole, an animal hole earby; your chopper pilot saw it from e air, old buddy, Why doesn't this okel let down? We don't need all is altitude on the way back? Maybe ɔt, friend, but the reason remains the me – time to auto-rotate and pick a nding spot just in case the engine es sputter and fizzle out. Finally e mission is over. Only the pilot ows how tired he is; no one else n appreciate how difficult a mission really was.

Supervisor! Monitor your boys get to know them, study with them, an with them – they are a part of ur success as a supervisor! The innt of this article is to give the superor an insight into the demanding d exacting work his crews are faced th. Perhaps it will serve as refresher ining for some chopper pilots. At y rate, it should provide better derstanding of the ways and means helicopter mountain flying.

Mountainous areas are the breed- places for all sorts of phenomena. course, winds and turbulence can generated in the plains areas or y other area for that matter by anging weather factors, fronts, ualls and build-ups. Rarely will y generate so quickly and feroously that you cannot accomplish famous "180" and scamper for me. No, only in mountainous ter- n can one valley be peaceful and offer no resistance while the next one offers so much in the testing of your skills and know-how and proof of the solidity of your aircraft and how well and how sturdy it has been built! I'm sure we are all familiar with the old expression, "Flying is hours and hours of utter boredom, punctuated by moments of stark, raving, terror." We know that *experience is a hard teacher* because she *generally gives the test first, the lesson afterwards.* How, then, can we prepare ourselves for these unexpected and unpredictable factors which involve the safety of our bird, our crew and our passengers? Unfortunately, there are no hard and fast rules to follow. The rules are as infinite as time or space. Each experience will probably never happen again in the same place, in the same sequence or to the same crew or to any other crew who comes rattling along.

A great difference exists between summer mountain flying and winter mountain flying. Let us look at the winter aspect first. In most respects it is the toughest. We have blowing snow from the ridge tops – this obstructs vision to flying, particularly if it's from the ridge where a landing must be made. In the valleys and on the soft slopes we encounter deep unknown depths of snow to land in, danger of tipping over, straddling a boulder or log, sinking in, lurching, never knowing which way the aircraft will settle when the blades lose all sustaining lift. White-outs during the last phase of an approach into a hover or a landing and blowing snow swirling around the cockpit from the rotor blast greatly reduce pilot vision. Same thing on takeoff until you're up and out. Above the timber line, no trees or rocks jutting up through the snow to provide a reference to the ground, depth perception nil, you cannot determine way of slope or angle of slope. Some ridges are completely covered with snow and a white overcast with no horizon to look at. Some ridges angle up and away from you, some angle down towards you. Soon you don't know what the true horizon is.

Suddenly the chopper shudders, you're out of airspeed, the vertical speed needle is up, the gyro shows you're not level! How can this happen when conditions are VFR? Simple, there is no natural horizon you can trust; you have encountered a form of spatial disorientation. Get airspeed, level the aircraft, resume climb until you are oriented. Then throw smoke, pick an object or toss something out of the aircraft that will scuffle or mark the snow where you want to land, anything to establish a reference point. As simple as this one seems, don't play tag with trying to get through the pass when there's a lot of snow on the ground and wisps of fog or clouds are obscuring your way. This is a real quick way to get the wife and kids a one-way ticket to their home town. There is one blessing to winter mountain flying – lower density altitude. A peak with a measured elevation of 8000 feet may register only 6000 on your density altitude chart during the cold months. Whereas in July or August it may be well over 10,000 or 11,000 feet. For you stiff wing type pilots, this amounts to lengthening the runways in the winter and shortening them in the summer. The lower the density altitude, the more safety factor we have. Fly your marginal missions, if possible, in summer or winter with lightened aircraft at or before sunrise and at or after sunset. You would be surprised at the increased safety factor this will provide.

Take away the snow and most of the problems mentioned disappear. In the summertime, rain squalls are to be avoided and caution still exercised to the utmost. Wet grass, rocks and mud can cause wheel slippage, roll the bird over, or start an avalanche! Check slope limitations in the Dash One. Anything over 20 degrees is real hairy. You may have to hover with the nose wheel on the ground, forward rotor tips inches away from obstacles, the rear wheels 8 feet up – still flying. Use the hoist for your

transactions; don't be stubborn and try to continue a landing. For the more difficult mission, land downhill a couple thousand feet. Off-load anything you can then try again. For the impossible mission, land downhill somewhere where there is no sweat and let your work party climb up to where the job is. Bravery and determination are admirable traits but serve as lousy excuses for avoidable accidents!

Some pilots may like to stay within handshaking distance of the ground as they climb up through the valleys and slopes. The smart pilot will climb before he gets there. Cross the ridges high. If you get caught in a sudden downdraft, there is time to peel off one way or the other to gain airspeed; power alone, in most cases, is not sufficient. The only times you should be close (a minimum of 500 feet) to the ground is when you evaluate your intended landing area, power check it, approach it, land on it and depart it. At all other times, it is healthy to have altitude.

Get behind the speed curve on the approach or on the takeoff and, buddy, you had better have a patch selected where you can lower the nose and zoom away into translational lift. Settling with power can stain your aircraft with chlorophyll from the vegetation beneath you! Beware of the irregular and jagged peaks. They break up the wind flow and will hurl turbulence at you in a million pieces and from as many directions.

o develop your wind consciousness, you not only have to know how to hunt for wind, but also where to find it. An experienced quail hunter would not think of wasting his time and effort hunting where he knew there were no birds. The wind hunter knows that downdrafts are on the leeside of the slope. He also suspects wind currents to be down slope in the morning and up slope in the afternoon. Areas of sunlight and shade can be tricky. As you fly from a sunlit area into the shadow of a mountain, you can expect a burble of turbulence. I have observed as high as six degrees temperature change in going from one to the other. Cool air settles and slithers its way down slope. Warm air is displaced and rises in the same manner.

The smart pilot knows that the wind rolls and curls over the crest of ridges and creates a bubble or swirl that can snatch your aircraft and toss it up and down. Yes, this pilot is continuously scanning for wind indications, smoke, rippling grass, bushes, trees, water ripples on a lake, birds on the takeoff – I don't know of any that takeoff downwind. A continuous watch will keep you fairly informed. You can dogleg and check your drift. For high landings, smoke grenades provide you with three essential bits of information – wind speed, amount of boil and velocity. But it has its
backs. Drop it inside the choppe
you're in real trouble. Tossed
weeds or a high and dry timber
it can start forest fires.

e have already mentioned
but keep in mind, the higher the
ing, the less your gross weight s
be. Years ago, the H-5 and eve
H-19A Dash Ones outlined wh
referred to as a diminishing
weight factor – 150 pounds for
100 feet of altitude. For take
sea level, you could fully gros
chopper, say at 7000 pounds.
for landing at a density altitu
6000 feet, your gross had to be
pounds. From rule of thumb
cedures such as these, our per
ance charts have slowly gone th
the process of evolution and ar
trustworthy charts – use them!

Another thing we often ove
– straight wing pilots are clea
cruise and maintain 10-11-12-15
sand feet. They are required
oxygen, which is not news

Only when airspeed, approach angle and rate of descent are controlled, can you say "I've got it made."

T, how many of you chopper peo- have a portable bottle with you en it's necessary to work at 10,000 over? With the coming of turbine wered choppers helicopters are led in to do jobs the piston engine oppers couldn't hack. A few years , I had occasion to work Mt. Mc- ley up to 16,500 feet. Our daily rations were from sea level to at t 12,000 feet. Who thought of us- oxygen in a chopper during rescue sions? No one! I suspect that two s died on this mission due to no gen. Their Cessna 180 was last in a turn, then a plume of smoke, all was quiet at 18,000 feet. We k. "Me need it? Don't be foolish, climatized." Little do we realize our reaction time is the first victim his hallucination. We know who second victim will be. I hope to the day when our choppers have t-in oxygen systems. There's room in the cockpit of today's copters to accommodate even a around bottle.

Obstacles to landing approaches takeoff routes are always of the ost concern to the chopper pilot. e are three items to be checked ng landing site evaluation—the nt of the obstacles, the size of the ing and the loss of wind effect. sharp pilot will not commit him- o landing until he has figured out her and how a safe takeoff can nade. In most cases, the size and ht of approach obstacles are ly related to the size area required fely land and takeoff from. Too times, pilots have landed in an like the bottom of a barrel and, takeoff time came, hit the first cle trying to climb, zoom or their way up and out. Some- , even a maximum performance ff is a feeble attempt to get airborne. Obstacles should be given all respect necessary. In some cases, 180-degree approaches and 90-degree approaches are necessary to avoid obstacles to landing.

Approaches should be made as nearly into the wind as possible and over the lowest obstacles. The same applies to takeoffs. Who can say whether for this particular takeoff the pilot should head into a 10-knot wind and attempt to clear a 100-foot obstacle in 50 to 75 feet? Would it be better to turn 20 degrees right and utilize 100 feet of run and then pull up over a 50-foot obstacle? Only the pilot can determine which method is the safest to attempt. There is a whale of a difference in whether the load is being carried into a particular clearing or out of it. Less room is required to carry the load in, more to lift it out. When the throttle is full open, the blades have maximum angle of attack and the manifold pressure needle is as high as it will go—you're not about to lift a load up over any obstacle! For the same reason, when carrying loads into high density altitude areas, a rate of descent of no more than 300 feet per minute is recommended. Anything higher than that can put you behind the power curve again. As you near the ground, sink rate may be so great that full power will not stop it. Settling to the ground and impacting on a ridge at 300 feet per minute can be a hairy situation. Only when you control airspeed, approach angle and rate of descent can you assure yourself that you have it made.

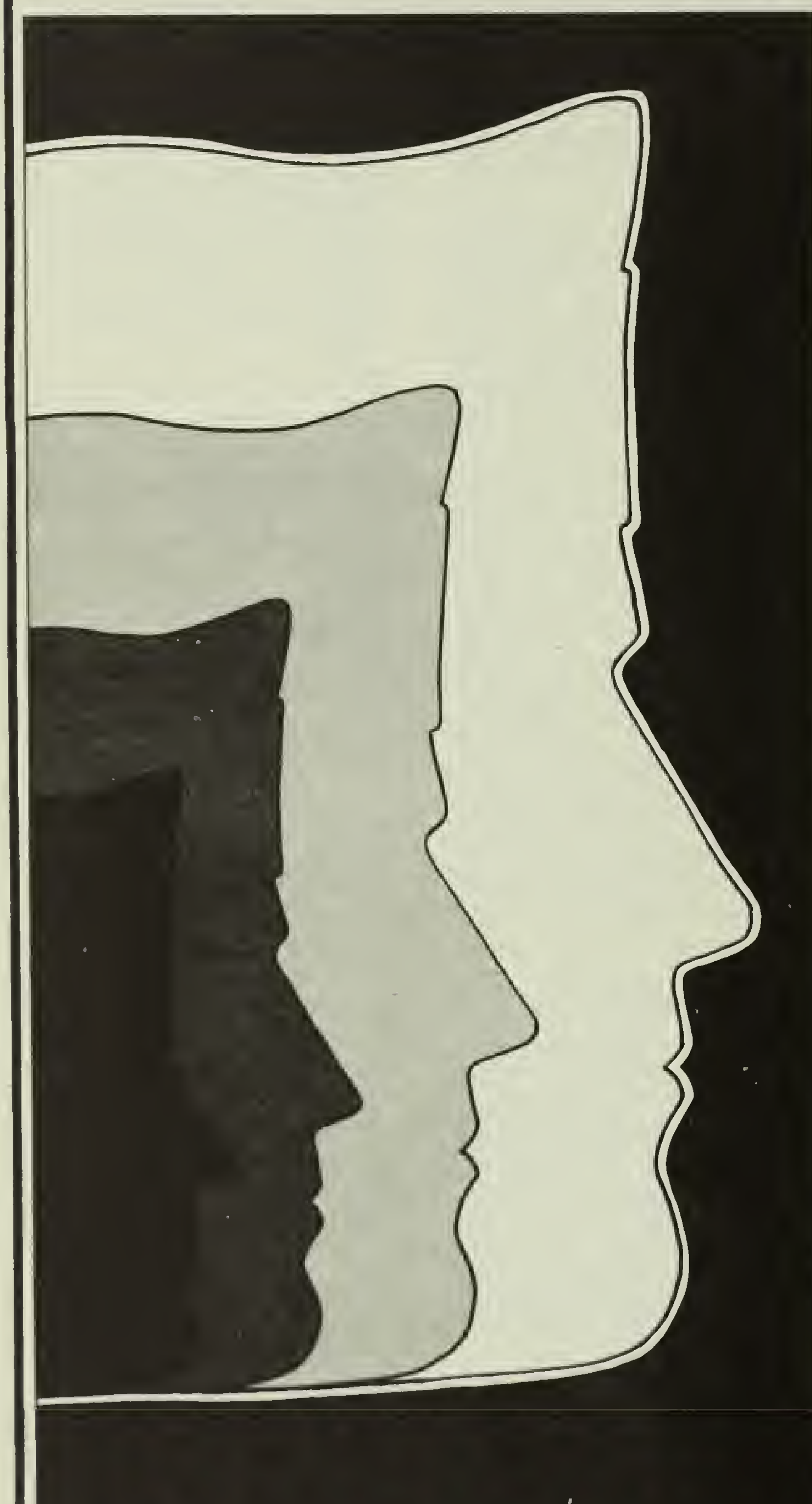
This is not the time to manhandle the controls. Gentle stick movements are necessary. You must be slow enough in the final stages of leaving translational lift behind you, at about 12-14 knots of airspeed, to allow the ground cushion to catch up to the aircraft and sustain it as you gently add what available power is left. At altitudes of 10,000 to 12,000 feet, a 100-foot per minute rate of descent during the approach is certainly the most desirable. The reason is simple—it doesn't take a sharp surge of horsepower to stop the rate of descent.

Even in the USAF Survival School they teach the survival students a bit about helicopter operating conditions and limitations. In case of bailout or forced landing, chances are, rescue will be effected by helicopter. Too many times survivors have placed themselves in locations where a helicopter cannot get close enough to land or else a difficult hoisting job has to be accomplished. If you anticipate rescue by chopper, then there are three factors that you should consider. In helping the chopper pilot, you are certainly helping yourself. Consider the altitude of your location, the terrain and obstacles and the influence of the direction and velocity of the wind. These items will assist you in the selection of a suitable landing place where the pick-up can be accomplished. You will have done your part. The rest is up to the chopper man.

(At the 1550 Aircrew Training and Test Wing at Kirtland, we teach the only sure method that has yet been devised to get in and out of mountainous confined areas of operation. . . .) If you cannot use those guides and if the power check doesn't give you the tolerance recommended, then friend, you had better seek another line of business to get into! (They stress landing site selection, landing site evaluation, high reconnaissance, low reconnaissance, power check, approaches, hovering and landings.)

Next month we'll look into the details of each. ★

Be The Best



Cliff L. Stout
Director, Flight Operations
Douglas Aircraft Company

Major Roger L. Jacks
Directorate of Aerospace Safety

The other day while g some research, I c across an article writte Cliff L. Stout at Douglas Ai It was entitled "Professiona and had been distributed operators of their aircraft. Th cle was subsequently publ by the International Air T port Association. It was a article, well written, which se to capsulize what the word fessional should mean to th line pilot. I'd like to share of Mr. Stout's comments wit since what he had to say is e beneficial to us. Take a few utes and give the article a pe

WHAT'S ALL THE UPROAR ABOUT?

O.K. So everyone wants perfection. Well, no other segment of the transportatio industry has ever come so c to it. Yet even the critics mu realize that we can only striv it. And that's where the troub That's what the uproar is ab Are we, you and I and every else, really striving for perfe Or are we sitting on our duff settling for considerably less perfection and just standing become a statistic?

If you as a pilot haven't he the phrase "complacency in cockpit" in recent months, y must be the only one who h It's a distasteful phrase, projecting the image of a sm know-it-all who has forgotte about the pitfalls of flying. In doing he has become one himself. By not constantly tr to do better, to eliminate eve chance for an error, he acce lowering of his standards an prepares himself psychologi for sub-par performances. T casual approach to a deman task has unquestionably resu

n the deaths of some of the
asual approachers as well as
nany of the not-so-casual
assengers riding behind them.

**ROFESSIONALISM—
R THE LACK OF IT**

The phrase "complacency in e cockpit" seems to imply that e occupants of that space have ecome so well satisfied with eir skill, judgment, excellent uipment, ability to cope and erall superiority that they can t down a bit and still do just as od a job. Like the Boston eltics playing the Podunk High " team. While occasionally this ay be true, it is more likely that overstates the case. Rather an a conscious letdown, what e appear to have is a lack of ntinuing effort to improve.

Someone sometime advanced e theory that an airline pilot's rformance could be graphed. ring his career he faces many allenges and, if he is to ccessfully continue that career, must rise to meet each one. the beginning, his level of rformance is low, but as he plies himself it rises. After a v years it peaks, levels off, and self-confidence, perhaps edom, maybe even satisfaction grows, it begins a w decline.

Vith a change to new ipment he is challenged again l the cycle is repeated. grading to captain is probably sternest test and usually ults in the most prolonged nb in the quality of his formance. Eventually it peaks, vever, and again decline sets One can easily picture such a ve on a graph, occasionally e will be brief excursions from norm, minor variations caused ncidents which shocked, red or otherwise instructed the t and resulted in a temporary nge of direction. But in the run the shape of the curve vary little.

bviously a far more desirable curve would be one which reflected the normal variations when challenges are met, but did not peak and then decline after a few months or years. Rather it should reach a plateau, not a flat one, but one which slopes slightly upward.

How does one achieve such a performance pattern? By being a full-time professional. You say that's what you are? Then you know why Heifetz still plays scales on the violin, why Jack Nicklaus walks directly from the 18th green to the practice tee, why Rich Little entertains himself for hours doing imitations in front of a mirror. A full-time professional continually seeks to improve by eliminating mistakes.

**PREPARATION FOR FLIGHT—
BE PROFESSIONAL!**

Reliance on someone else, whether it be the other pilot, a dispatcher or the Almighty, for a weather briefing or a review of field conditions can be hazardous. The first two might miss something which you consider significant and the third may not be on your side. It's better to arrive early and devote the necessary time to a thorough look at conditions.

You reply, "We're going to go anyway." Maybe and maybe not. Don't assume anything. Get in the habit of making a complete preparation for every flight, regardless of the weather. Then it won't sneak up on you. But it takes a conscious effort to develop the habit. That's what a professional does.

Get to the airplane early, not late. Complete preflight inspections and checklists ahead of time. Last minute rushing causes mistakes and professionals shouldn't make mistakes in anything as simple and basic as checklists.

Preparation for flight also includes being physically ready, maintaining one's health and getting proper food and rest. A pilot reporting for a flight in ill health, insufficiently rested or hungover places an unfair burden on his fellow pilot and jeopardizes the safety of the flight. He is not acting professionally.

**CHECKLISTS—
BE PROFESSIONAL!**

The checklist helps you to make sure that certain things are accomplished, correctly, every time. Both pilots share the responsibility for the completion of the checklist, but the one reading the challenges has the larger share. He must first make sure that he doesn't skip any items. He should consider that the other pilot is doing something besides waiting to hear his dulcet tones. He should be sure he has the man's attention before reading a challenge. And he should read the challenges as they are written, every time. Colorful individual interpretations with rhymes and clever patter thrown in may be enjoyable to the author, but most pilots don't use them. Most use the phrases as written. Hearing something else when you are expecting the standard challenge is distracting, confusing and leads to errors. The professional way is the right way, the way that eliminates errors.

**COMMUNICATIONS—
BE PROFESSIONAL!**

A professional radio operator knows that "communication" means "the transmission of information" and it implies the reception and understanding of the information. Otherwise it has not been communicated. A professional knows how to communicate most effectively with a minimum number of exchanges. He uses conventional terms and standard phraseology in the proper sequence to eliminate repeating or misinterpretation. He also observes regulations concerning ATC contacts such as reporting altitude on initial call, reporting

and reporting the reception of the ATIS.

He does these things because they reduce the repetition of calls and they eliminate errors.

PRECISION— BE PROFESSIONAL!

With the equipment now at our disposal, precision flying is easier than ever before. Witness the few missed approaches in two hundred and one-half weather. But precision flying shouldn't be limited to approaches. The airways should be flown just as precisely.

A professional doesn't do anything in an amateurish way. We, as professionals should fly exactly on course and exactly on altitude. No one enjoys having ATC broadcast to him and the rest of the world that he is five miles off the centerline. A professional is precise, too, in following standard operating procedures, observing speed restrictions and operating limitations without the presence of a check pilot to inspire him. A professional doesn't need a check ride.

WHAT ELSE MAKES UP PROFESSIONALISM?

Years of experience teach a pilot so many things that a catalog of them would fill volumes. However, certain general topics emerge which can be discussed in a few paragraphs.

Beginning with "A" for no particular reason, we think of "alertness." Whereas a pilot's keeping the wings level, maintaining altitude and course and "keeping his head on a swivel," now the autopilot flies the airplane and radar controllers point out traffic. We hope. Is hope enough? Not enough for a full time professional. He spends his time monitoring instruments and looking around.

Being constantly aware of exactly where one is in relation to airways, outer markers, airports and most important, the ground, is another form of alertness. In these days of almost continual radar vectoring, complete reliance on an outside agency for navigational guidance is the easy way, but it can lead you down the garden path or up the proverbial creek. It is not the professional way. Healthy skepticism of a radar controller is not an insult to his ability; it is a tribute to your professionalism.

The responsibility shouldered by an airline pilot when he departs on a flight is awesome. Acceptance of responsibility these days is unusual. Thus the airline pilot becomes unusual. People expect more of him. This becomes an additional responsibility, a responsibility to conduct himself at all times in a way that is a credit to him and to his colleagues, in a way that moves people to look up to him, not sideways, or even down. His high professional standards should be carried over into his personal standards. In a job that is of necessity largely integrity must be unquestioned. Cheating should never occur to him. His reports of "on, in, out and off" times should be just as precise and exact as his ILS approach with 1800 RVR. The pilot who doesn't meet these standards damages his own reputation and those of his colleagues.

A cockpit organized along highly professional lines will never have room for complacency.

BE THE BEST!!

Be the best is becoming m than a challenge in the Air For it's becoming a necessity. I'm putting you on, pulling your jive talking you or pumping garbage. With the emphasis realistic training we are ask more from our aircrews th ever before. Aircrews are tr ing harder, participating in m joint exercises, flying lower, fas getting more out of their airc and being subjected to war tr ing scenarios that in the past laid on a planner's desk. Red F is an example of an exercise thrives on realism and will doubtedly better prepare our crews for future conflicts. Be prepared? You bet! But what be the price we pay in lost crews and equipment? answer to that question will determined by us!! If we hone try to be the best and acc plish every task in a professio manner, I'll give "The Greek' to-1 odds we train better wit lower mishap rate. ★

WANTED: TECH EDITOR

This fall our technical editor for *Maintenance* magazine will be leaving. The position requires a personable SMSgt, AFSC 43199, with a broad maintenance background and who also enjoys meeting people at all levels. Applicants should have above average writing ability and be PCS eligible. Previous writing and/or safety experience is desirable.

Anyone with the above qualifications, who would like a very interesting and challenging assignment may write or call us at:

Safety Magazine Bra
AFISC/SEDA
Norton AFB, CA 924
AUTOVON 876-2113

OPS TOPICS

ARE IN THE COCKPIT

Following the mission, the crew ember pulled the helmet bag from xt to his seat and his interphone rd tangled and fired the man-seat parator initiator. Nobody in the ay and therefore no blood, no foul, ght? Wrong! Could have been ody, and most of us have at one ne or another stuffed a check- t, helmet bag, jacket or other as- ciated garbage next to our seat. ke care and don't store things ere they may get caught in the chinery.

NTROLLER CHATTER

A multi-engine, multi-crew mem- transport was shooting an ap- ach to a sister service field in mar- al weather. Handoff to GCA final ntroller placed the pilot on an ex- mely noisy and confusing fre- ency. The freq had bleed-through m a nearby civilian airport which, pled with continuous controller tter and marginal weather, led to CA which placed the aircraft in a ition wide of centerline. The inci- t will be checked but it sets an throttle bender remembering "if 're up to your epulets in soup and approach isn't going good, for reason, go missed approach and ighten out the problem." If the ation is critical enough (meets rgency criteria), two emergency ntion-getters are GUARD and/or 0. They should be last resort don't let yourself get backed into rner without options.

CREW DISCIPLINE

lany things we were taught in T should keep us from bashing the terra firma . . . but only if we remember and practice discipline. A young crew recently jumped into their Phantom for a night instrument practice mission. The weather was forecast to be the type that you could probably plan on seeing ground from or only slightly above minimums. After aborting the original machine, they were preflighting a replacement, and the AC was unable to get the lights to work on the primary attitude indicator. He turned the cockpit utility light on the ADI and pressed! Yes, Virginia, let me review—*Night, Weather, Instrument practice mission,* turned the C-4 light on the ADI and pressed!

Their first approach at one of the local airports started bad and got worse. They turned in tight, stayed unconfigured, picked up a high rate of descent, the utility light slipped or failed, they attempted a go-around and didn't make it. Two fatals? No, as luck would have it, the machine bounced and both folks ejected before the Phantom bounced again and then burned. Super lucky crew members who have their Martin-Baker chairs to thank.

- AFR 60-16 requires operative cockpit instrument lights for night flight with good reason.
- Right after takeoff, you'd better plan on asking for an extended pattern due to higher weights, speeds, etc.
- If the approach isn't working as planned, start the go-around *early.* Food for thought!

HOW GOOD ARE YOUR PREFLIGHTS?

An alert aircraft commander inspecting a T-39 found a second stage turbine blade snapped in half, a first stage compressor blade nicked, and two empty rivet holes on the forward lip of the engine nacelle. That is particularly commendable when the weather conditions are considered. The engine intake on the T-39 aircraft is not very easy to preflight, but on a frigid, predawn departure it is virtually impossible. (Footnote: The empty rivet holes were the result of incorrect rivets being installed in the engine intakes.)

The second, equally observant, aircraft commander detected a small static leak at a chafe mark around the hydraulic pressure line on the main landing gear actuating cylinder. Further investigation revealed three other aircraft from the same base with similar chafing.

Flight crew inspections are designated to check the aircraft general condition and not to duplicate inspections already performed by maintenance personnel. However, they are also in an ideal situation to look at the "big picture." Remember that a few extra minutes on that walk-around can save hours of paperwork later. Do you just kick the tires and light the fires?—Sqn Ldr John C. Griffiths, RAAF, Directorate of Aerospace Safety. ★

HOW HIGH IS YOUR

Lt Col Robert J. Vanden-Heuvel
Armament Development and Test Center
Eglin AFB, FL

As any jet crew member knows, to get from A to B on the least amount of fuel, you go high. How high depends on what you're flying, configuration, distance, etc. If you are a qualified jet crew member, you should be proficient at determining optimum cruise for your aircraft. Can you say the same about endurance?

For purposes of illustration, assume that you are to perform a sea-level mission at a designated point. Upon reaching the point and working altitude, you find that th will be a delay and are instructed hold to conserve fuel. For an F-4 consider a gross weight of 45,00 lbs and drag index of 20; A-7, 30,000 lbs/50; F-111F, 80,000 lbs/50. Out of the top of your he

ENDURANCE COMPARISON CHART

Acft Type	(Ft X 1000) Altitude	Endurance FF	FF	ΔCF	1 Hour Saving
F-4	SL	6500	---	---	---
	5	6200	300	225	75
	10	6000	500	450	50
	15	5850	650	625	25
	20	5700	800	925	-125
A-7	SL	2700	---	---	---
	5	2550	150	100	50
	10	2460	240	200	40
	15	2400	300	300	00
	20	2340	360	425	-65
F-111F	SL	6300	---	---	---
	5	6100	200	250	-50
	10	5950	350	550	-200
	15	5800	500	850	-350
	20	5800	500	1150	-650
F-15	SL	4800	---	---	---
	10	4350	450	250	200
	20	4000	800	500	300
	30	3800	1000	800	200

nolding altitudes for delays
, and 60 minutes. No fair
ne or air refueling. For the
mplicity, assume you will
rmitted a fuel-saving
Do not confuse this
vith a possible divert
which is really a range/
blem. Estimate how much
vill save at your chosen
r each time interval. When
ne this, read on.
ompanying endurance
n charts were constructed
ormance data from each
light manual. Endurance
for each altitude is from
um endurance fuel flow
F is the difference in
fuel flow between a
ltitude and sea level.
(CF) data from the
wer climb charts assumes
is at climb speed. The
n is what we are after,
e fuel saved by climbing
lar altitude and holding
. It is determined by
the climb fuel from the
by holding at that altitude
(△FF - CF). Again, for
time in the climb was

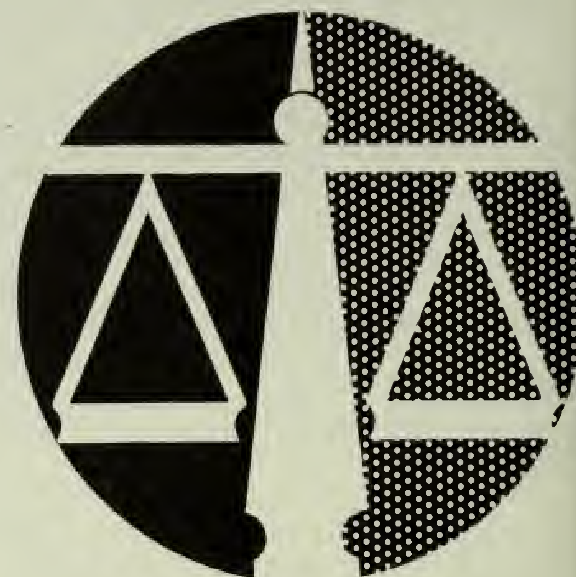
chart shows that the best saving you can expect by climbing for a one-hour hold is 75 pounds and you only have to go to 5,000 feet to do it. Ten or fifteen thousand feet saves less, and going higher will cost you. Holding for an hour made the computations easy, but is unrealistic. How about half an hour? Fifteen minutes? With a fixed expenditure of climb fuel and a reduced saving of holding fuel (½ or ¼ △FF), you are going to spend more fuel by climbing than you will save at altitude. The F-4 5,000-foot saving becomes −75 pounds for 30 minutes and −150 pounds for 15 minutes. The A-7 is worse than the F-4, and the F-111F is the worst of the three. The F-15 was better, showing a saving of 300 pounds in an hour at the optimum altitude of 20,000 feet, but still incurring a 100-pound loss for a 30-minute hold. How did your estimates turn out?

If you accept 30 minutes as a maximum reasonable holding time for a fighter aircraft, it follows that there is no fuel-saving advantage in climbing to a fuel-conserving altitude while holding, at least for the aircraft configurations checked. Since sea-level operation offered the best case for climbing, starting altitudes above that produce lower savings. You can see that by analyzing the charts, if you care to.

Naturally, if you are at a higher altitude to start with, stay there. If you are at Warp 9 when the call to hold comes, zoom to exchange airspeed for altitude. What you don't want to do is invest fuel that won't be paid back.

The purpose of this exercise was to stimulate further thought about a subject that is seldom dealt with and less frequently understood. When I began it, I did not realize that the fuel savings were as little, or the optimum altitudes as low, as they turned out to be. Interested individuals should try other configurations or consult the performance charts of other jet aircraft to see how they compare. If you want to, take into account time in the climb, time and fuel in the descent, bank angle, and the variation of gross weight with time. I don't think they will significantly change the results. You may improve the results by using low drag index numbers and low gross weights, but that is not realistic. As far as I am concerned, the best rule of thumb for climbing to conserve fuel while holding is — forget it! ★

your system may be reliable, but IS IT SAFE?



Donald L. Kurle

When we in the Air Force decide to add a new weapon system to the Air Force inventory, the list of requirements that our new system must satisfy will invariably include high reliability and a high degree of safety. Our new system must perform its intended function at the intended time and place, and it must do so in a safe manner.

Unfortunately, system designers, builders, and users often equate reliability with safety. A great deal of time and money is spent on a weapon system to make it reliable with the assumption that a reliable system is also a safe system. Generally, it is true that the more reliable a system is, the safer it is. If we are to take an airplane trip, we naturally feel safer in a reliable airplane than in an airplane that is not quite as reliable. However, it is not always true that steps taken to improve system reliability automatically serve to improve system safety. It is this point that we will explore further.

For our purposes, system reliability is defined as "the probability of a system performing adequately for the period of time intended under the operating conditions encountered." An accident is defined as "an unplanned event that causes expenditure of resources, injury, illness, or death." A system can be considered to be "safe" when the risk of accident is acceptable.

When discussing reliability, a system is thought of in terms of the components that make up that system. The reliability of the total system depends upon the reliability and arrangement of the individual components. The same is true of system safety.

It is axiomatic that the reliability of a system is always reduced by adding a component in series with other components and is always improved by adding a component in parallel with other components. This does not necessarily hold true for the safety of a system. We must also realize that systems are usually not of the pure-series or pure parallel type but are a mixture of both.

Let's examine an imaginary, simple system and see what happens to the safety of the system when we take steps to increase and decrease the system's reliability.

Assume we are developing a new "Cobra" surface-to-air missile system and we are going to conduct a series of test launches. As s
Figure 1 our missile is conn
a power supply through a swi
that when the switch is closec
is supplied to the missile a
launched. We can say that
tem is composed of thre
ponents – missile, power
and switch. (Actually, our
is composed of many com
but for purposes of illustra
assume three components.)

Let us further assume that th
can fail in two ways. First,
close (short) inadvertently b
are ready for launch, in which
missile would explode on th
pad or inadvertently lift off
dent). Second, the switch c
to close when activated res
no missile launch (system fa
no accident). From a reliabil
point we are interested in bo
modes. From a safety view
are also interested in both
modes, but we are most inte
the failure mode which will
accident.

Assuming our switch h
tested adequately, we know
liability of the switch is 0.8
probability of failure is 0.2) a
the switch fails it fails close

point here is that while it is always desirable ve a highly reliable and highly safe system, an increase e does not necessarily increase the other.

e and open half of the time. re, in Figure 1 the probability switch operating successfully qual to 0.8 and the probability vitch failing such that an acci- ults (Pa) is equal to 0.1.

our system appears to be un- we can ask ourselves what do to make it more reliable. ide that if we put a second switch in parallel with the first we will increase reliability (see Figure 2). Now, for our system to fail, both switches have to fail. Our system will operate properly if only one switch functions properly. Ps is now equal to one minus the probability of both switches failing or Ps = 1 - (0.2) (0.2) = .96, we have indeed increased our switching reliability (from 0.8 to 0.96). But let's take a look at what we have done to system safety. Again if one switch fails closed we have an accident, and now we have twice as many switches as before. Pa is now equal to one minus the probability of both switches not failing closed or Pa = 1 - (.9) (.9) = .19. Our probability of having an accident has increased from 0.1 to .19.

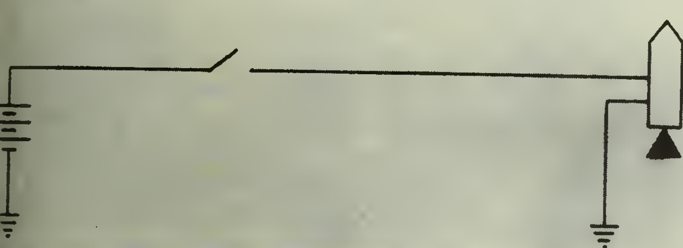


Figure 1
COBRA MISSILE SYSTEM

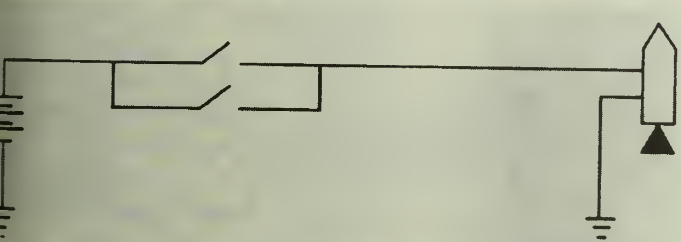


Figure 2
COBRA MISSILE SYSTEM WITH PARALLEL REDUNDANT SWITCHES

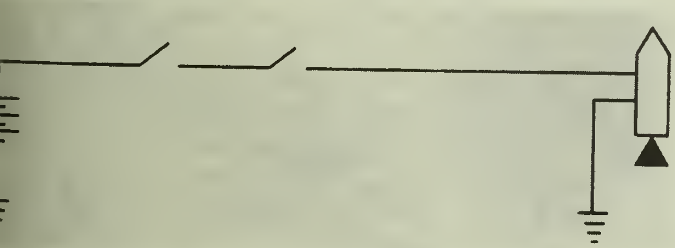


Figure 3
COBRA MISSILE SYSTEM WITH SWITCHES IN SERIES

If we now decide that our system, although reliable, is not safe enough we can modify the switch arrangement again. Let's see what happens if we put two switches in series (see Figure 3). In this case the system will operate properly only if both switches do not fail. Our probability of success (Ps) is now equal to (0.8) (0.8) = 0.64. However, to have an accident both switches must fail inadvertently in the closed position. No accident will occur if only one switch fails. So the probability of an accident equals the probability of both switches failing in the closed position or Pa = (0.1) (0.1) = 0.01. Thus, in this situation, our reliability has decreased from 0.8 (for the original one switch system) to 0.64. But our probability of having an accident has decreased by a factor of 10. This arrangement gives us a less reliable but safer weapon system.

The point here is that while it is always desirable to have a highly reliable and highly safe system, an increase in one does not necessarily increase the other. We in the Air Force who deal with highly sophisticated systems on a daily basis must ensure that steps taken to increase the reliability of our systems do not increase the risk of accident to an unacceptable level. This applies equally to system designers, builders, and users, and applies throughout the entire life cycle of any system. ★

Problems to Anticipate With the Growth of Marijuana Smoking

Hardin B. Jones, Ph.D.
Senior Scientist,
University of California

is is the best paper we've seen on the subject of juana and its use. We highly recommend it, espe- to aircrew personnel. Permission to present it has been granted by *Executive Health Report*, Box 589, Rancho Santa Fe, CA 92067, holders of orld copyright.

oday, many adults smoke marijuana. Some start using marijuana to help themselves stop drinking. Some use it in an attempt to revive their failing powers. Some find marijuana a substitute for tran- ers or other medication. Some use the drug to keep th the younger generation. Although the reasons users smoke marijuana may differ somewhat from asons given by younger users (who may use it for dentification or to alleviate social and sexual prob- associated with adolescence and early adulthood), eterious effects are much the same. Those past the when they plan to become parents may not worry ch about genetic damage as should younger users, damage to the brain and the sexual mechanisms by marijuana should still be a subject of concern.

more than a decade, we have been subjected to a of articles, books, and reports supporting the idea oking marijuana is simple fun and has no serious uences. Earlier observations that marijuana was to mental disorders, to the use of narcotics, and to lity changes have been declared "obsolete" or erated." That these early observations are now ed by scientific studies and that many of the early were carefully conducted have been ignored.

e are problems with many of the reports supporting mlessness of marijuana. First, examinations of na smokers early in their use do not reveal the long- ffects. Second, as marijuana causes adverse be- changes that the user cannot recognize in him- ne investigators may have been deceived by their periences with the drug. Because they cannot have l that marijuana would turn out to be as free of m effects as most well-tested medicines.

ghout the same period that the promarijuana re- ere being published, the World Health Organiza- continued to warn against the use of marijuana. h some promarijuana inquiries in the past were ed by the British and Canadian governments, these ents have since issued clear warnings about mari-

ffect of marijuana is probably never transistory. ana is an unusual drug in that the active ingredi- hydrocannabinol (THC), is retained in the body for long periods of time. One study, conducted by Louis Lemberger of the Indiana University School of Medicine, has indicated that 30 percent of the THC is retained in the body at the end of a week. Similar retention occurs whether the users are heavily or lightly exposed to marijuana. From animal studies it appears that the 30 percent retained at the end of a week is eliminated much more slowly than the first 70 percent. Therefore, with repeated exposure, THC accumulates in the body.

THC is changed only slightly by metabolism. In this process, some is converted to a more psychoactive form. (There are about fifty cannabinoids in marijuana; those that have been studied retain their basic cannabinoid structure and fat solubility even though partly altered by metabolism). THC is highly fat soluble and is, therefore, deposited in the fatty outer membrane of cells, but there is reason to be especially concerned about its effects on brain cells and on the reproductive process.

Damage to the Cell Membrane

An important source for information on the toxic effects of THC on cells is the report of a symposium on marijuana presented at the Sixth International Congress of Pharmacology held in Helsinki in 1975.

More recently W.D.M. Paton, professor of pharmacology at Oxford, and Robert Heath, chairman of the Department of Psychiatry and Neurology at Tulane University, and their colleagues have shown the profound changes that occur in the surface membranes of brain cells in animals exposed to doses of marijuana within the range of typical human doses. Changes have been found to occur in the membrane of brain cells, red and white blood cells, liver and lung cells, and sperm.

Marijuana appears to injure the fine, hairlike extensions of the brain cell membranes that communicate with the other brain cells. Such damage is critical, for although each cell has tens of thousands of these connectors, the brain needs them all. They are the mechanisms of the mind.

One important study on the damage caused to the brain by marijuana has received too little attention. The late A.M.G. Campbell of the Department of Neurology, Bristol University, conducted a study of ten consecutive cases of young marijuana users who showed marked behavioral changes. X-ray examinations of their brains revealed that all suffered from cerebral atrophy. The degree of atrophy correlated with the duration of marijuana use.

In the United States, Harold Kolansky and William Moore, professors of psychiatry at the University of Pennsylvania, were able to correlate the appearnace of the symptoms of organic brain disease with marijuana use. In the Journal of the American Medical Association (June

2, 1975), they stated: "In our reports, we detailed the toxic psychological effects of cannabis use in 51 of our patients, all of whom demonstrated symptoms that simultaneously began with cannabis use and disappeared within 3 to 24 months after cessation of drug use. Moreover, a correlation of the symptoms to the duration and frequency of smoking was established. When these observations were coupled with the stereotyped nature of the symptom seen, regardless of psychological predisposition, we presumed that with intensive cannabis use, biochemical and structural changes occurred in the central nervous system."

That marijuana can cause brain damage has recently been confirmed by Robert G. Heath. In his study, Heath exposed monkeys for six months to doses of marijuana corresponding to moderate and heavy doses. Before the brains of the monkeys were examined, they were taken off marijuana for eight months. The site and degree of brain atrophy in the monkeys were similar to those in the young men in the Campbell study. Heath also examined the hair-like extensions of the brain cell membranes and found that these synaptic structures were also altered.

The findings of the Heath study were important confirmations of the Campbell study. The brain damage associated with marijuana observed in these two studies appears to account for the behavioral changes often observed in marijuana users.

Genetic and Embryologic Damage

THC has been associated with genetic changes through the suppression of cell division and the alteration of protein synthesis. E. Sassenrath (in the 8th Technical Review on Genetics and Drug Abuse, August 1976) has reported recent findings on the increase in malformations in the offspring of monkeys exposed to marijuana. These results, the first definitive findings on primate malformation associated with marijuana, confirm the results of earlier studies involving laboratory rodents. As many developmental abnormalities were found in the offspring when the father monkey alone was exposed to marijuana as when the mother was.

Even before Sassenrath's study was published, there was reason to suspect an association between malformation in human offspring and exposure to marijuana. Statistical tabulations on the number of malformed infants born in the United States over the past decade are now available. Although malformations had been on the decline in the United States for thirty years, since 1970 (coincident with the rise in marijuana use) there have been striking increases in malformations of the hip joint and of the cardiovascular system. It will take several years to compile more complete data, but it seems probable that marijuana use is the cause of this epidemic of malformation

Two major studies have shown genetic and c mental damage in laboratory rodents after expo marijuana. One unpublished study, conducted by Lynch of Saint John's University, New York, ex the transmission of defects to succeeding generati cessive abnormalities appeared in two generatio exposure of the original animals. In this instance c generations were studied. The other study condu Peter Fried of Carlton University, Canada, estab variety of genetic changes in offspring of rats exp marijuana. Developmental abnormalities were fou equally frequent after the exposure of either male o parents.

There are indications that the risks involved wi mal" marijuana use probably exceed the gene associated with exposure to sublethal levels of ra

Damage to the Respiratory System

With marijuana, because fewer cigarettes are less carbon monoxide is taken up in the blood. H the lungs of the marijuana smoker become more than those of the tobacco smoker.

The correlation between cigarette smoking a cancer, emphysema, and other respiratory prob well known. Emphysema is found in 52 percent who smoke more than a pack of cigarettes a d three percent of nonsmokers develop emphysema

Tobacco smoking diminishes lung capacity. The of oxygen transported in the blood is decreased wh hemoglobin unites with molecules of carbon m rather than oxygen. In addition, the lungs are irri the smoke and become inflamed.

With marijuana, because fewer cigarettes are s less carbon monoxide is taken up in the blood. H the lungs of the marijuana smoker become more than those of the tobacco smoker. The irritation is because THC is more tightly bound to the carbon in the smoke than nicotine is, and, in order to get a the marijuana smoker must inhale deeply and smoke in his lungs. After even a short period of e as the carbon particles accumulate, the lungs of t juana smoker change permanently from pink to b

According to the Leuchtenbergers, working a stitute of Experimental Cancer Research in La Switzerland, marijuana smoke causes a greater ra degree of damage to lung cells than tobacco smoke by the U.S. Army indicate that lung impairmen more rapidly with marijuana. Precancerous lesio been observed in the air passages of the lungs of m

and autopsy examinations of the lungs of heavy smokers have revealed severe breakdowns in the ture.

a Vs. Alcohol

rijuana user is under the influence of the drug een highs.

na is often said to be like alcohol, but the two not at all alike. THC, the principal active in- marijuana is highly soluble in fat and insoluble THC remains in the fatty structures of cells riods and, with repeated use, accumulates there. a water-soluble food and is metabolized to ll energy. It leaves the body rapidly and com- ere is no residue.

e for molecule, THC is 10,000 times stronger ol in its ability to produce mild intoxication. le, one drink containing 10 grams of ethyl netabolized in an average-sized person in about to carbon dioxide, water, and acetone: 50 grams produces mild intoxication and is metabolized ve hours. Only 5 milligrams (1.011 gram) of quired to produce the same degree of intoxica- is removed slowly from the body, and many required to recover from its effects. The mari- s under the influence of the drug even between

ecades for irreversible brain changes to appear drinker. In the marijuana smoker, irreversible es may appear within three years.

a is a complex mixture of many cannabinoids, ch may have different effects on the body. In e retention of the cannabinoids in the body even small doses may have adverse effects. adverse effects correlate with the duration of an with the size of the dose, and there may safe range of exposure. With alcohol the ad- are brought about by the larger doses.

cades for irreversible brain changes to appear drinker. In the marijuana smoker, irreversible s may appear within three years. Comparing cannabis, W.D.M. Paton, professor of phar- xford University, said: "The price (in health) na) overuse is paid in adolescence or in early e for alcohol overuse is paid in later life." h cancer and cardiovascular disease, which cigarette smoking, alcoholism is another of lth problems of this country. With the increas- arijuana, another major health problem has led. The problem is increased when marijuana is used with alcohol, as it often is. The two druges in combination have a greater effect than the sum of their individual effects.

Sensual Drugs and the Pleasure Centers

Sensual drugs, of which marijuana is one, are drugs that the body has no need for but that give the user a strong sense of pleasure. These drugs affect the reflex centers located deep within the cerebrum that appear to be the site in the brain of the pleasures we derive from the body, including the pleasures of eating, feeling alive and fit, and sex. The pleasure centers are probably very important in the development of learned behavior, for, along with pain, they form the basis for conditioning. Self-activation, emotions and mood, memory storage and recall, perception and awareness, desire, satisfaction of appetites, and sexual activity are dependent on the balance of reactions in these reflex centers.

The pleasure centers become active after marijuana is smoked. This has been demonstrated by Heath, the discoverer of the pleasure centers. Heath observed the response to marijuana of humans who had undergone brain surgery during which electrodes were placed at the site of the pleasure centers deep within the brain. He conducted similar studies on monkeys.

Although the pleasure centers are activated artificially by marijuana, the process would probably be more properly termed irritation, as the normal operation of the pleasure reflexes becomes impaired after they have been activated by marijuana. With heavy exposure to marijuana, the operation of the pleasure centers is suppressed. This suppression seems to correspond to what many researchers have called sensory deprivation. Sensory deprivation becomes progressively more severe the longer marijuana is used.

Even those who do not seem to be much affected by marijuana show a marked degree of recovery of their sensory perception and thought processes after several months of abstinence. The user's memory is the first thought process to improve; then his thought formation becomes more vigorous; finally, after several months of abstinence, he begins to notice that he feels more alive. The recovery of the sensual capacity comes last. The restoration of sexual inclination and capacity is a pleasant surprise to the person recovering from the chronic effects of marijuana. Although the user often was not aware of the gradual dimming of his mental and sensual functions he feels his recovery and is impressed by this proof that marijuana had indeed had adverse effects.

I have had less opportunity to study adults than I have

Problems to Anticipate With the Growth of Marijuana Smoking continued

men and women in their late teens and early twenties, but they seem to follow the same pattern in their recovery: mental functions that had not been missed return, especially memory and the accuracy of thought formation. However, for older people, recovery may be slower. This is to be expected. The body metabolism gradually declines with age and decreasing physical activity. The accumulated marijuana is eliminated from the body through the circulation and is excreted in the bile; this process is vigorous in youth and declines as we get older.

On Addiction

Contrary to many reports and popular belief, marijuana is chemically addictive. It is addictive because the user can develop tolerance to its effects and suffers withdrawal symptoms when he abstains. The withdrawal symptoms are mild, so mild, in fact, that until recently they were not recognized as withdrawal symptoms. The mild symptoms include irritability, restlessness, and sleeplessness. More intense withdrawal symptoms have been observed in persons exposed for a few weeks to high doses of THC: restlessness, sleeplessness, rapid onset of irritability, loss of weight, nausea and vomiting, diarrhea, salivation, sweating, hot flashes, runny nose, hiccups, and electroencephalographic changes during sleep.

The mildness of the marijuana withdrawal symptoms is explained by the fact that THC accumulates and is retained in the brain and body fat. Other sensual drugs that are not stored in the body produce more marked withdrawal symptoms.

Actually, there is an inseparable relationship between chemical and psychological addiction, and the two forms coincide when the addictive substance is a pleasure-giving drug.

Much debate over the dangers of specific drugs centers on the question of chemical or psychological addiction. A purely psychological addiction is usually considered controllable through conscious effort. Chemical addiction is considered less susceptible to mental control. Drugs thought to be mere psychologically addictive are considered relatively harmless; those that are chemically addictive are thought to have more serious consequences. Actually, there is an inseparable relationship between chemical and psychological addiction, and the two forms coincide when the addictive substance is a pleasure-giving drug.

The sensual drugs give pleasure chemically by stimulating the pleasure centers below the conscious level. The brain produces psychological responses to the chemical stimulation of its pleasure mechanisms. The brain's controls then become adjusted so that unmistakabl fort results if the chemical is not supplied. Thus, and psychological addictions are developed at time. Breaking a chemical addiction may be sir pared with breaking the psychological addictior a psychological need for chemically induced drives even occasional users to repeat drug use

On Marijuana and Sex

The magnification effect fails, and the sensor become anesthetized.

Some adults begin to use marijuana in an revive their failing sexual powers. They say does this by expanding the sense of time and by the senses of touch, sight, and hearing. The ap effect some users claim marijuana has can also be through the power of suggestion. Because the lieves in the effect, he actually feels the effect for a time.

If the user, however, becomes tolerant of the begins to take larger doses or more potent kind juana, he may find that he is decreasing the sensory information his brain interprets as pl The magnification effect fails, and the sensor become anesthetized. The sense of touch dimir a result, although marijuana may seem to enha the beginning when taken in small doese, it bec gressively less satisfying as a sexual stimulant.

Older users who take marijuana to enhance lives may find that at first the novely itself incre desire and makes the sex act more exciting. tinued use, however, their pleasure usually dec they stop using the drug, they may find that they come conditioned to arousal only with the aid o and so cannot perform without it. If they are try higher doses, the numbing effect increases may have difficulty reaching a climax. They n their difficulties or impotence on advancing age them, however, could probably recover their and mental health through the proper effort.

The vigor or failure of the sexual capacity not dependent on the sexual organs. These c merely appendages of the skin, and, except for prolapses that may affect either man or women rarely occur. the sexual organs remain mechanic tional for the life of the individual. The sexual sexual inclination, erection, preorgasmic events and postorgasmic changes – all center in the br

Many separate brain functions are involved in cycle, including the functions of both divisio

ic nervous system (the divisions of the brain below
 of consciousness that rule over the vegative
 of the body and also regulate mood). The norms
balance of the functional divisions of the brain
 for sexual activity are probably narrower than
 types of responses. In the young and healthy
he brain is able to compensate for much disturb-
the balance of the divisions of the autonomic
ystem brought on by alcohol, marijuana, or more
 drugs. Thus, in the young, the sexual functions
show many signs of disturbance. With age, the
c nerve centers lose their capacity to adjust, and
l response mechanisms are much more likely to
ly affected.

of Marijuana on Other Mental Functions

re, however, many marijuana users in factories s who appear to be normal but who suffer chron- n an altered judgment that may affect the quality ork.

e all seen examples of the tragic effects of mari-
he mind. Marijuana smokers seem to suffer from
emotional responses, disordered thinking, dull-
slothfulness. Early in the use of the drug, these
l changes appear to be reversible, but as exposure
, recovery is less and less complete. Those most
affected are usually not employed. There are,
 many marijuana users in factories and offices
ar to be normal but who suffer chronically from
l judgment that may affect the quality of their

ost extensive study of the lingering effect of the
gs was conducted at the request of the Egyptian
nt by Professor Soueif. Over a period of twenty-
, he observed 850 cases of hemp-drug users,
 matched against control cases. Both the users
ontrols were given standardized tests of mental
The tests showed that "those with a higher level
on and/or intelligence – show the largest amount
ration from marijuana use." It appears that the
e detrimental changes induced by marijuana
mpaired judgment and a diminished capacity to
nsibility.

na has an adverse effect on the performance of
 jobs. The user is frequently lethargic, lacks
n, is prone to error, has trouble remembering
 details, and cannot think practically about the
hese transformations are gradual and are not
 the obvious signs of impaired ability; it is easy
 alcoholic, but not so easy to spot the marijuana
user.

The dullness of the marijuana user appears long before he can actually be called amotivated. Although there have been no proper quantitative studies of the degree to which marijuana use induces carelessness, lack of attention, or failure to achieve the highest job performance level; the cost of marijuana use to the individual and to society appears to be high. In industry there appears to be as much reason to limit the job responsibilities of the marijuana user as to limit those of the alcoholic.

Studies of the influence of marijuana on drivers have shown that marijuana impairs judgment and reduces the driver's ability to gauge distance, speed, and road conditions. The severely altered behavior typical of the chronic marijuana user suggests that driving performance would be impaired even between uses: the user is never free from the burden of the active material.

There are other reasons for believing that the judgment of marijuana smokers is impaired. Marijuana users often accept the use of LSD, heroin, or cocaine, while the nonusers reject these more powerful drugs. The adverse effects of marijuana ranks next to the adverse effects of opiates as the reason given for admission to federally financed treatment centers. Marijuana use interferes with practical success and produces alienation, sometimes mild, but sometimes severe enough to be called paranoia.

Recognizing the marijuana user in the early stages of use presents a problem. The appearance of the residues of the cannabinoids in urine can be used to indicate use within the past twenty-four hours. The level of THC in the blood, fat, or feces can be used as an indication of the average level of intake over a period of many months. Chemical testing for these re idues is now possible but expensive; rapid, inexpensive methods will probably be developed. A legal issue will then arise: Does a firm have the right to require that employees take a test for marijuana use?

A Case History

Until recently most of the requests I received for advice about marijuana were from people in their teens and early twenties. Now I am receiving more and more requests for help from older people.

Recently an executive who read my article in Private Practice telephoned me. "Your article described me," he said. "It enabled me to comprehend how desperately I need help." He had started to use marijuana a few years ago, he told me, at the invitation of a just-out-of college salesman he had hired. He found smoking marijuana a great way to unwind and began to smoke more and more

frequently. "I now roll and smoke a joint six or seven times a day," he said. "To have enough appetite to eat, I usually have to start smoking before breakfast. If I haven't stoked up since the previous evening, I get so paranoid by morning that I can't bear my awful thoughts. I got my wife started on marijuana, and now she is even worse off than I am. She has begun to have headaches continuously. We've tried to quit now for several months, but we can't; we need help. What shall we do?"

Bit by bit, under my questioning, he revealed that his income, which had been quite high, had fallen to a minimum. He had changed from a robust, healthy, enthusiastic, sexually active man, in love with his wife and devoted to his family, to a man emotionally empty and sexually and physically inactive. He and his wife, he felt, had stayed together only because there was no better alternative for either of them. He has begun, he said, to lose weight – his buttocks are now too thin to sit on a hard chair; his face is thin and sallow; his fingers tremble; and his memory plays tricks on him. His wife's headaches have become worse and worse. (From interviews with drug users, I have found that women get headaches after prolonged exposure to marijuana, whereas men get headaches during withdrawal.) Both he and his wife desperately want to return to the life they had before they started smoking marijuana.

They are already on the way back, for they sincerely want to stop using marijuana. But to be able to abstain completely, they will undoubtedly need professional help. Their recovery should be striking after six months of abstinence; their full recovery will probably take several years.

Recent research indicated that marijuana is far from harmless, and . . . chronic use can produce adverse psychological and physiological effects. Therefore, its use should be strongly discouraged as a matter of national policy.

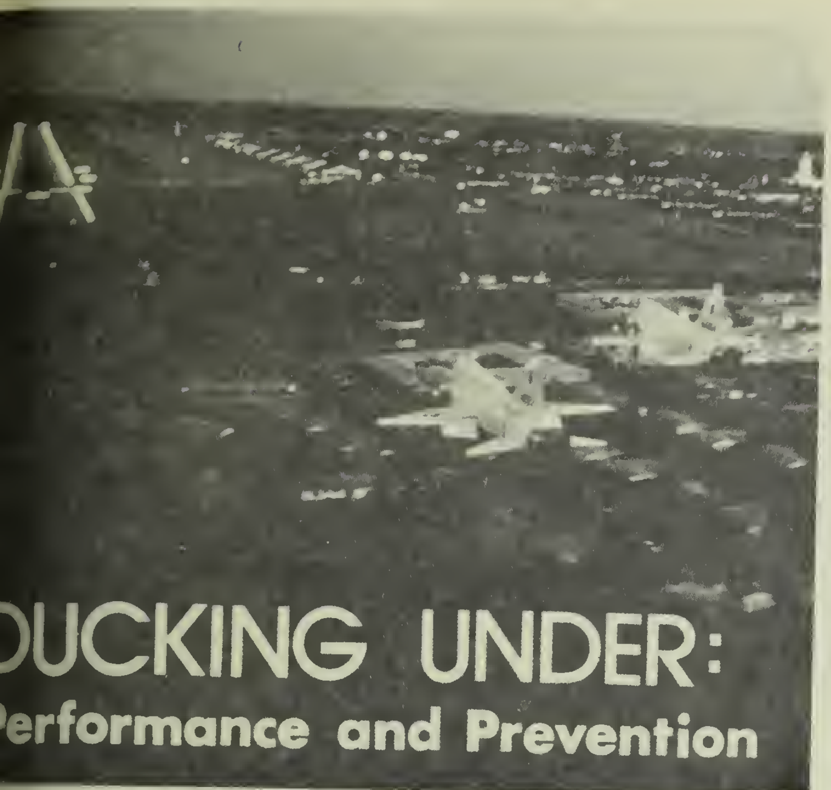
The belief that marijuana is safe has become so entrenched that the steadily mounting proofs of its dangers are ignored. The political movement to "decriminalize" (legalize) marijuana has distracted attention from the health hazards. There are those in government, education, and science who have chosen to cope with the marijuana problem by making light of it or by condoning the use of the drug. For example, the following statement was treated merely as a footnote in the 1976 Annual Report to the President by the Domestic Council Drug Ab Force. "Recent research indicated that mar far from harmless, and . . . chronic use can pr verse psychological and physiological effects. T its use should be strongly discouraged as a mat tional policy." When such statements as this a in footnotes, it is easy to see why people become

This situation must change, for, in my ex people are eager to know the facts. When I e effects of marijuana to audiences, someone alw "Why haven't we been told this before?"

I believe that if people know the evidence i the real dangers of marijuana, they will be di from using it. In my teaching of drug abuse cou University of California, and in my counselin the world, I have found that by explaining how functions and how marijuana affects this func was able to help people stop using the drug an others from experimenting. The study of the fascinating. The brain is the master control for and body. It governs sensations, moods, thou actions, not by a magical process, but by a comp of chemically regulated controls that are easily sensual drugs. People become interested in know the programming of sexual development in the b the brain's control of sexual functioning and sexu ing can be disturbed by drugs; how drugs can brain to make colors appear brighter, sounds cl odors more intense; how drugs distort image sense of time. They learn the causes of dru hallucinations, flashbacks, memory loss, ple pain, and changes in mood. They are usually to learn that these effects occur in the brain an though fascinating, they are indications of distu function.

All that we are is in the interactions of our br

Our thoughts and perceptions as normal perso be improved by drugs. All that we are is in the in of our brain cells. With this understanding of brains work, the false notion that the mind is ex drugs can be replaced by a more profound appre the complexity of our being. When orders in drugs are interferences rather than additions to p they will be in a better position to reject the use altering drugs. ★



DUCKING UNDER:
Performance and Prevention

Ron Sams • 9th Air Refueling Squadron • Beale AFB, CA

few years ago, eleven of Boeing's most experienced instructor pilots all crashed same day. Though the average time logged by these captains er 10,000 hours, each landed f the runway. Nobody was ecause these crashes took n the simulator.
ally, the pilots were part of eriment that was conducted to determine why four 727's had crashed in rapid succession during landings at Tokyo, Cincinnati, Salt Lake City, and Chicago. A model of a lighted city was constructed which was visible from the simulator windows. Each pilot was instructed to perform a visual approach using all instruments except the altimeter.

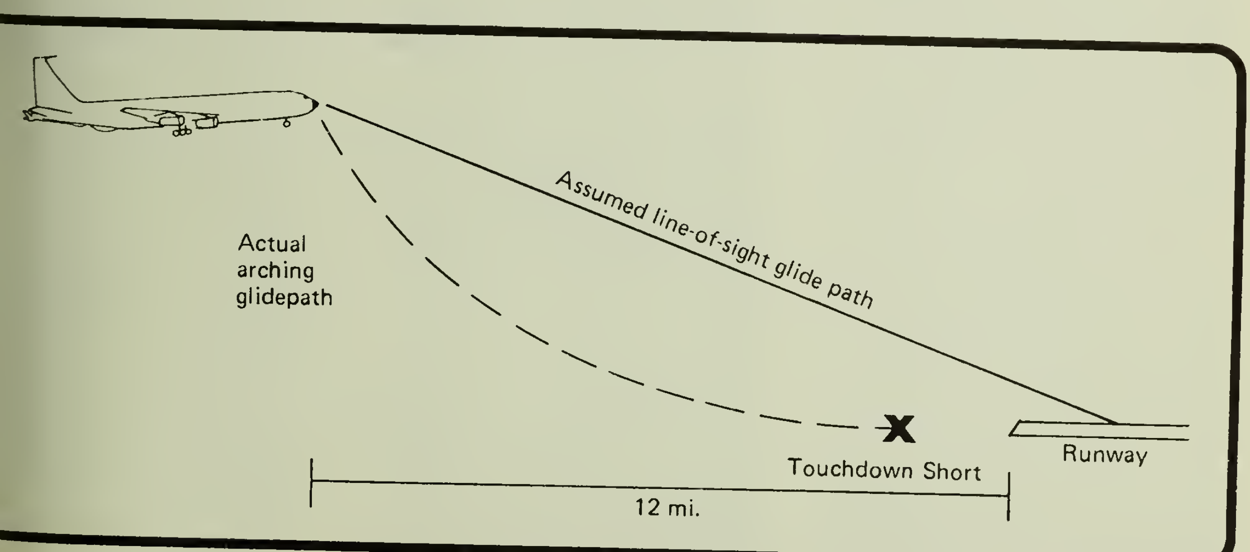
In effect, this experiment simulated what happens when the pilot leaves the instruments and "goes visual" for landing. Eleven of the twelve pilots in the simulator experiment landed short. (One guy made it safely. He was a former Navy carrier pilot.) Each pilot was somewhat dazzled by his unspectacular performance, because this should have been a "piece of cake" maneuver. It wasn't.

Why would eleven highly experienced pilots duck under the proper glide path and land short? The study concluded that perhaps there was more to the duck under problem than simple pilot error. The pilots in the experiment were actually being asked to solve a problem which exceeded normal visual ability.

Given the proper set of circumstances, any pilot will duck under, regardless of experience level or eyesight. As an instructor pilot, I've seen many duck under maneuvers performed, especially at night. Usually the pilot believes that perfect glide path is being maintained and is mildly outraged when I direct a go around. Why don't pilots recognize a duck under? To find out, let's discuss some visual phenomena which serve to deceive even the most proficient pilot.

Assume we are shooting a straight-in approach from approximately 12 miles (fig. 1).

1



Though line-of-sight is a straight line, it's possible for the actual flight path of the aircraft to follow the arc of a circle whose circumference hits the ground short of the airport. As the aircraft arcs below glide path, the pilot shifts his aim point up in the windshield and maintains line-of-sight with the touchdown target. The pilot assumes that a precise glide path is being flown, yet the aircraft is actually arcing toward a touch-down point short of the runway.

Our eyes are especially deceived at night, and a number of factors can contribute to a duck under. Beware of approaches over dark water or land where there are no lights below or to the side of the aircraft. It is impossible to visually judge your height above the terrain. Sloping or irregular terrain surrounding the airport, or an extremely wide or narrow runway present sensory illusions. Subconsciously, the glide path will be adjusted to reproduce the visual approach picture you're used to seeing (i.e., the home drome syndrome). This may cause you to duck under and land short.

When smoke, fog, haze or other obscurring factor reduces the brightness of the lights below, it can create an illusion that the airplane is too high. This can cause you to prematurely lower the glide path angle or visually change your aim point. There are many other circumstances which can create visual illusions and cause you to duck under, but let's discuss what happens to the airplane when the pilot ducks under.

Consider a KC-135 flying a normal 2.5 degree glide path (fig. 2). Remember, the main landing gear is about 65 feet behind and 14 feet below the pilot. If the pilot maintains a precise 2.5 degree glide path, the main landing gear will cross the runway threshold at approximately 25 feet above the runway (assuming no landing flare). Using the standard 1,000 ft visual

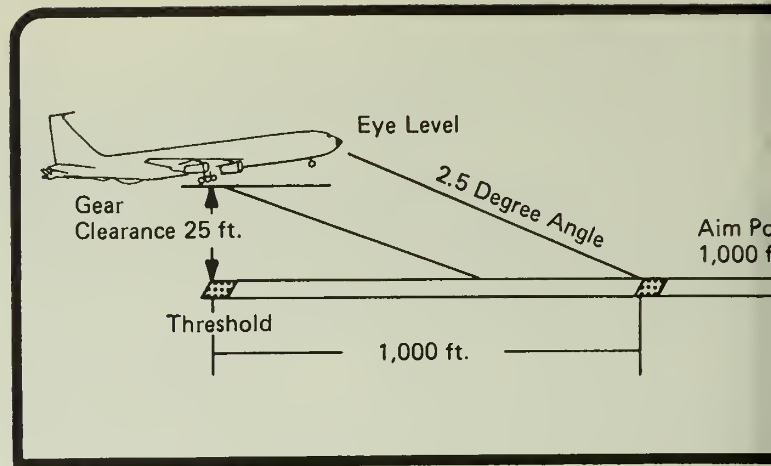


Figure 2 Approach path with normal 2.5 degre angle and 1,000 ft target visual aim p

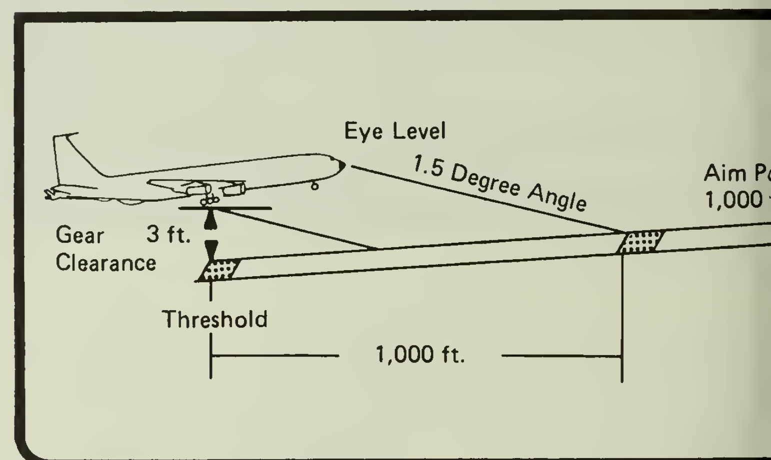


Figure 3 Approach path with 1.5 degre angle and 1,000 ft target aim

aiming point, there is surprisingly little room for error.

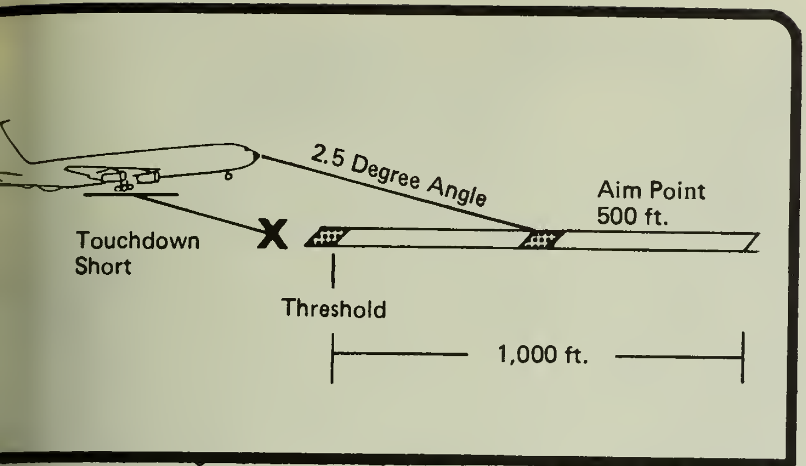
Now let's add some visual illusions and consider the possible effects. Suppose the pilot shoots an approach to a runway with a 1 degree upslope. Believing that the airplane is too high, he ducks under and changes his glide path to a flatter 1.5 degrees (fig. 3). At this shallower, dragged-in approach angle, the landing gear will cross the threshold at approximately 3 feet.

Next, let's suppose there is a smoke, dust or fog layer which is lying low across the touchdown zone of the runway. The pilot maintains the 2.5 degree glide path, but changes the visual aiming point from 1,000 ft to 500 ft (fig. 4). The

airplane will touchdown sh runway.

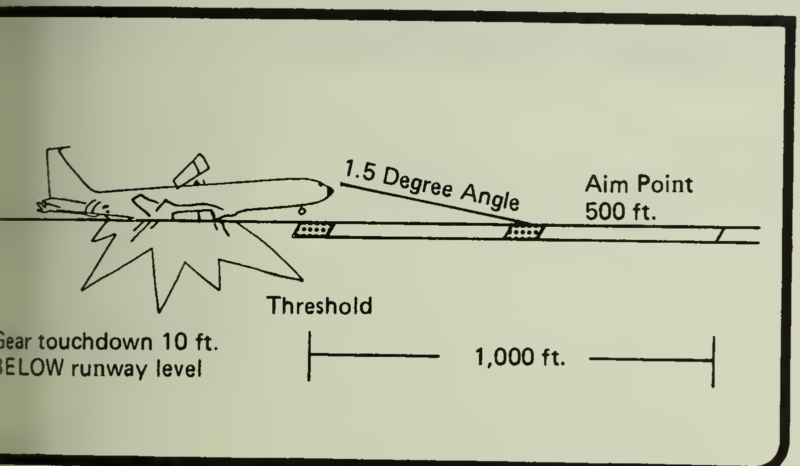
Finally, let's discuss the dangerous case. Suppose t shooting a night precision in the rain. Let's assume t disregards his instruments minimums and ducks unde below a ragged ceiling. Le assume that he also chang visual aiming point closer of the runway in a misguid attempt to provide additio stopping distance. The pil committed two sins. He ha his glide path to 1.5 degre changed his aim point to 5 this case, the landing gear and touch down 10 feet be runway at the threshold! (

If you are on course an



ach path with 2.5 degree approach
ınd 500 ft. target aim point

Figure 4



ach path with 1.5 degree approach angle
0 ft. visual aim point

Figure 5

hen you break out at ıms, don't radically change ıg. Yanking the power off and at the runway in order to h what you think is a al" approach creates a high te close to the ground. This is ous to your health. If you ff from a duck under using elevator, you will quickly urself in a poor thrust/life ship.

pproach speeds, a small e in AOA causes a relatively crease in drag, thus requiring ıan normal thrust. If the setting is too low, there may enough engine spool up time the sink rate. The flatter the h angle, the more difficult it sually detect any rate of change. Therefore, the pilot flying a dragged in approach may not realize his aircraft's sink rate is greater than his means to stop it. If you add a sudden wind shear, the situation quickly becomes hopeless.

How do we prevent duck under maneuvers? First, admit to yourself that your eyes can lie to you, and that your "normal" approach may not be normal at all. There are too many visual illusions to fake out your eyes.

Secondly, don't give up vertical guidance (i.e., ILS glide slope, PAR glide path or VASI) after you go visual. Have your copilot cross-check the glide slope while you are visual. Once you go full scale below the glide slope, or red over red on the VASI, it's impossible to tell exactly how far below the proper glide path you really are.

Remember your altimeter. If the approach has published altimeter checkpoints, use them. Monitor your descent rate. For a 2.5 to 3 degree glide path, the rate of descent should be approximately 700 feet per minute. If your VVI is grossly out of that parameter, it should tell you something. You either have a strong headwind/tailwind, or a duck under.

Your radio altimeter can be used to help determine your absolute altitude after you go below the DH/MDA. One technique is to have the pilot not flying the approach call off the radio altimeter readings at 100 ft, 50 ft, and 20 ft. This is not designed as an order to flare for landing, but as an additional cross-check for height above the runway to aid the pilot's depth perception.

Remember that the performance of your jet right now has been determined by what you did a few moments before. If your approach is stable, on glide path and airspeed, and the airplane is properly trimmed, nothing drastic should happen when you look outside at minimums. At some bases, the PAR glide path and the VASI may not agree, so don't let it sucker you into ducking under. If you're fighting to stabilize the approach, take it around.

The last 200 to 300 feet of any approach demand the utmost in professional discipline. The safest approach, considering the stopping distance and the landing gear clearance over the threshold, is along a normal 2.5 to 3 degree approach path using a visual touchdown target 1,000 feet down the runway. The possible consequences of ducking below those parameters are devastating.

The next time you find yourself well below the glide path, or VASI red over red, remember what happened to a handful of Boeing IP's. They crashed in the simulator. You may not be so lucky. ★

CAPTAIN
Donald A. Roberts

CAPTAIN
Ronald B. Lunsford

187th Tactical Reconnaissance Group
Dannelly Field (ANG), Montgomery, Alabama

On 19 July 1978, Captains Donald A. Roberts and Ronald B. Lunsford were flying a day low level reconnaissance mission in an RF-4C at 500 ft AGL and 600 kts when the master caution light illuminated. The aircraft utility hydraulic system had been lost. Captain Roberts began a climb toward home base as Captain Lunsford confirmed through the rearview mirrors that hydraulic fluid was streaming from the aircraft. A chase aircraft joined to escort the disabled aircraft home. The tower was notified that an approach end arrestment would be necessary. Enroute, Captain Lunsford completed an exhaustive preview of procedures for emergency gear and flap extension and barrier engagement. When the emergency gear lowering system was activated, only the right main and the nose gear extended, the left main remaining full up. This condition was visually confirmed by the chase aircraft. Captains Roberts and Lunsford assessed their situation and decided to land the aircraft. All attempts to extend the hung gear were fruitless. Captain Roberts instructed his chase aircraft to land and set up an orbit to allow other inbound aircraft to land. Captain Roberts requested the base to foam the runway and disconnect the MA-1A on the approach threshold. A slightly flat and fast approach was decided upon to enhance aircraft control during the landing phase. When fuel was reduced to the preplanned fuel weight of 2,000 lbs, the approach was begun and the aircraft touched down 500 feet in front of the cable. The left drop tank contacted the runway momentarily but Captain Roberts was able to elevate the wing until barrier engagement, thus preventing damage to the cable. As the aircraft slowed down, it began to skid to the left uncontrollably and a fire ignited in the left drop tank area. The aircraft stopped on the runway 85 feet left of centerline and the crew safely egressed. The only damage to the aircraft was a destroyed drop tank and a small amount of fire damage to underwing surfaces. The high standard of airmanship and crew coordination demonstrated by Captains Roberts and Lunsford, their thorough evaluation of the situation, and their totally professional execution of emergency procedures prevented the loss of a valuable aircraft. WELL DONE!

CAPTAIN
William O. Spradling, Jr.

CAPTAIN
James F. Wilson

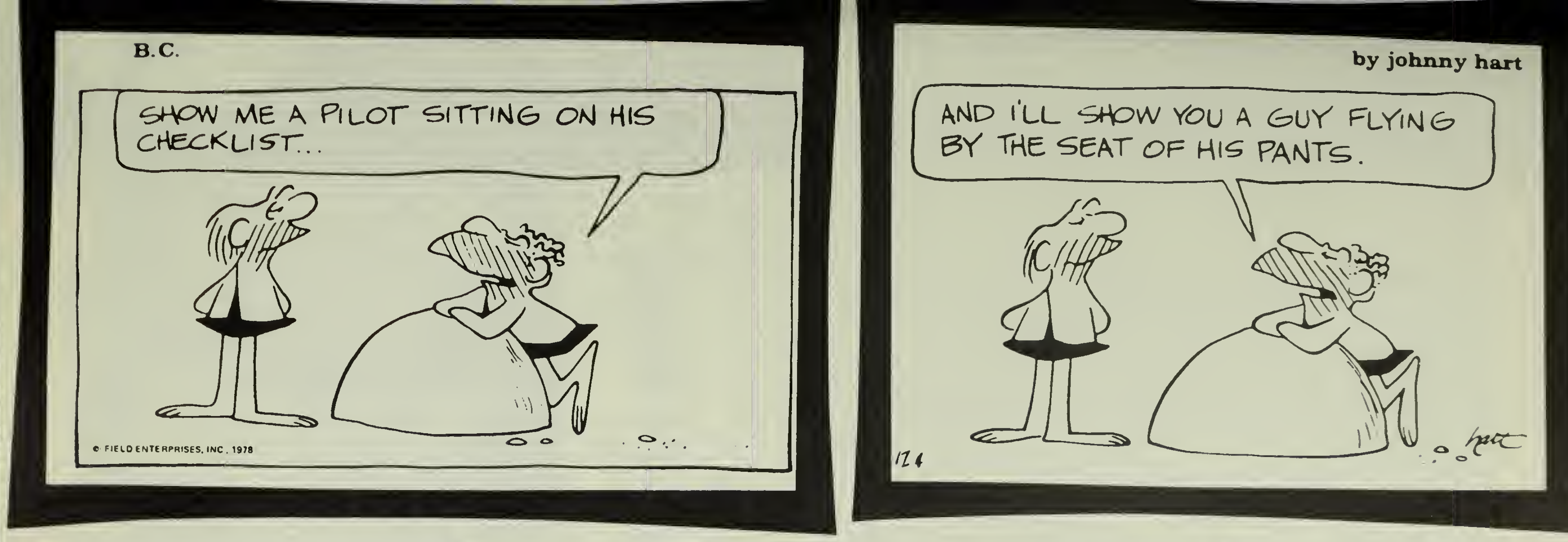
35th Tactical Fighter Squadron

Captains Spradling and Wilson, flying an F-4D, were number two in a close air support mission. While maneuvering at 420 knots and 10,000 feet, there was a noticeable loss of thrust and Captain Spradling saw the left engine rpm decreasing through 80 percent and noted low fuel flow on the left engine. The rpm stabilized below idle, so the aircrew elected to shut down the engine and attempt a restart which was unsuccessful. Captain Wilson requested a snap vector toward Kunsan AB, notified the SOF of the emergency and that a single engine approach was planned. When the speed brakes were lowered to increase drag, the utility hydraulic pressure fluctuated below operating limits. Approach control told the aircrew to expect a GCA. During landing gear lowering, the utility hydraulic pressure decreased to zero and all three gear indicated unsafe. Captain Spradling then extended the landing gear using the emergency lowering system. The empty external wing tanks were not jettisoned through the overcast due to populated areas below and because of the likelihood of their striking the gear and compounding an already critical situation. The aircrew informed the SOF of the loss of utility hydraulics and their intention to engage the departure end barrier. Captain Spradling positioned his disabled Phantom on a 15-mile, 250 knot final approach at 5000 feet MSL. Shortly after they entered the undercast at 3000 feet MSL on a 5-mile final GCA, transmissions became unreadable, whereupon Captain Spradling transitioned to a TACAN final approach. The aircraft broke out of the overcast at 1000 feet MSL and 2 miles on final. Once the landing was assured, power was reduced to 200 knots for touchdown. When past the approach end barriers the hook was lowered and a successful departure end BAK-13 arrestment was accomplished. The exceptional airmanship and professional reaction of Captains Spradling and Wilson to an in-flight emergency resulted in the successful recovery of a valuable aircraft. WELL DONE! ★

STATES AIR FORCE

Well Done Award

resented for nding airmanship l professional rmance during ardous situation and for a ant contribution to the States Air Force dent Prevention Program.



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AEROSPACE

ETY • MAGAZINE FOR AIRCREWS

JUNE 1979

THE MISSION–SAFELY

MAJOR MICHAEL D. BLANCHARD • Directorate of Aerospace Safety

■ It's that age old problem again—mission accomplishment versus safety considerations. I think we can safely assume that all dedicated Air Force crew members have a strong sense of mission accomplishment. The problem arises when this desire to accomplish the mission interferes with the crew member's judgment in the area of safety. Very few crewmen would willingly jeopardize safety of flight during peacetime conditions. However, questionable decisions in combination with unforeseen events can lead to a dangerous situation.

Consider the case of a B-52 on a normal training mission. During climbout the aircraft lost nr 1 hydraulic pack, and just after level-off the right aft alternator shut itself down. Neither of these problems calls for any critical action, although the Dash One says consideration should be given to terminating the flight if one alternator has become inoperative. The decision was made by the AC to continue the mission. About 2 hours later the aircraft lost another alternator. The Dash One states the loss of two alternators requires that the mission be terminated as soon as practicable. The mission profile was continued, and on the last leg home a third alternator was lost leaving only one alternator to supply electrical power to the entire aircraft. Nonessential systems were shut down, and the aircraft recovered with no further difficulties.

Usually a serious aircraft mishap is caused by a chain of events; if you violate procedures or circumvent established safeguards, you may be providing all the links of the chain but the final one.

The crew was lucky in this case; the press on attitude did not cause a mishap, but the potential was there. Usually a serious aircraft mishap is caused by a chain of events; if you violate procedures or circumvent established safeguards, you may be providing all the links of the chain but the final one. In essence, you have relegated a redundant safety system to a single failure, catastrophic consequence, system.

A positive example of mission dedication integrated with safety awareness was emphasized in another B-52 mishap report. During preflight, the tail gunner determined his oxygen system was inoperable. He, therefore, had the turret stowed and came up to the forward compartment. This decision soon proved very wise since the aircraft lost pressurization at high altitude and had to descend with the crew on oxygen. Had the gunner elected to press on without a properly operating oxygen system on the premise that the compartment was pressurized, and he could remain in his compartment and complete his mission requirements, he would have had a very serious problem.

Again, the point is that procedure and requirements are not established to prevent a crew from accomplishing a mission, but rather to ensure the safe accomplishment of that mission.

Compliance with established directives and procedures in conjunction with sound judgment is essential in preventing the completion of an accident chain. ■

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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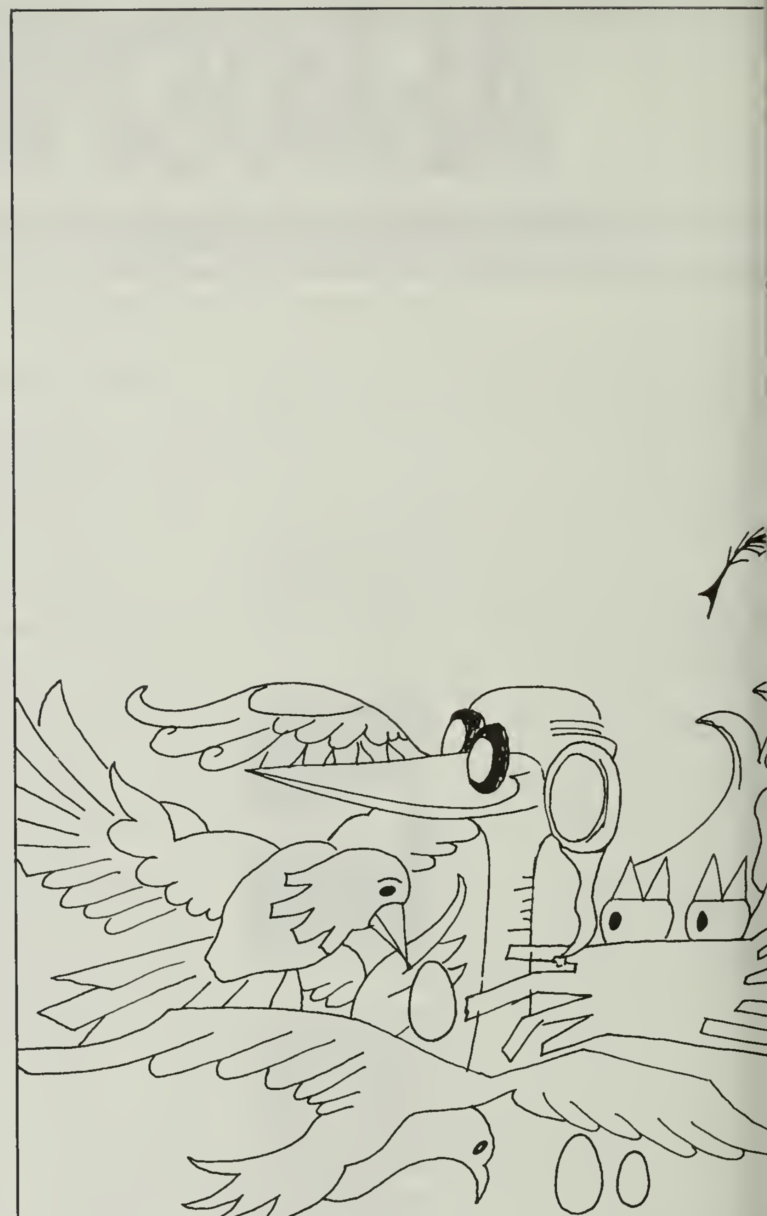
MAJOR JAMES GILLESPIE, CF
Directorate of Aerospace Safety



The Bird Nemesis

■ In 1911, a man called Cal Rogers flew across the Continental United States from New York to California. It took him 49 days, 30 landings and 19 crashes. In the spring of 1912, while still a hero, he collided with a gull in California, his plane crashed, and he was killed. Thus, he became the first bird-related flight statistic. Aviation has come a long way since 1912, but aircraft birdstrikes continue to be frequent, costly and hazardous. Progress is being made in reducing this hazard, but the problem is still with us and your appreciation of the bird situation is very important.

In January 1978, AFR 127-15, The Birdstrike Hazard Reduction Program, came into effect which requires that all birdstrikes now be reported using AF Form 441, Birdstrike Report. Previously only those encounters of a kind causing aircraft damage as specified under AFR 127-4, Investigating and Reporting U.S. Air Force Mishaps, were reported. This provided an incomplete picture, without adequate feedback, and did not place the bird problem in proper perspective.

Records show that during CY 1977/1978, there were 506 birdstrikes to USAF aircraft, which resulted in $3.7 million in damage. During this same period, two aircraft losses were attributed to birds: an F-111 ingested a bird and the aircrew ejected too late; an A-10 pilot attempted to avoid

ing a bird at low altitude, lost
ntrol and successfully ejected.
s estimated that for each
nage birdstrike reported, five
ditional strikes occurred without
nage. Statistics for CY 1978,
first year of AFR 127-15,
w that 1,187 birdstrikes were
orted. Sixty-one percent
urred during takeoff and
ding, 31 percent happened
ow 3,000 feet AGL, including
level navigation routes, and 5
cent occurred during range
rations. The remaining 3
cent were in the area above
00 feet AGL. A
roportionate 19 percent of all
e occurred at night.

nese figures are not exactly a
lation but follow a generally
erstood trend. It can readily
een that two areas deserve
ediate attention: that area in
around airports and the low
navigation area.

tionally, it can be seen that
s to and from ranges should
t or above 3,000 feet AGL to
mize the bird hazard,
cially during the morning and
ing hours when bird flocks
moving to and from their
ng areas.

further expand on the two
serious areas of bird
rd, they will briefly be
ssed separately. Each base
a flying mission has a
trike Hazard Plan which your
ts will influence. The
ity of birdstrikes occurs at or
airports, but because the
ff and landing are at relatively low speed, very little airframe damage results. Don't let this lull you into a false sense of security. A bit more thought will reveal that this is a hazardous regime where the engines are operating at high power settings and thus are very susceptible to damage from bird ingestion.

There are numerous airfield maintenance programs aimed at reducing the local bird population. Essentially, the denial of water, food, shelter and security makes airfields a less desirable bird habitat. In addition to bird scaring devices such as Falconry, shell crackers, distress transmitters, flashing lights and trapping, experiments are underway with chemicals aimed at repelling birds from within airfield perimeters. Identification of local and transitory bird species will determine the type of top cover and vegetation growth to cultivate on the infield. By your accurate reporting of all bird encounters, the magnitude of the problem will be understood and countermeasures more easily supported.

The majority of birdstrikes occurs at or near airports, but because the takeoff and landing are at relatively low speed, very little airframe damage results. Don't let this lull you into a false sense of security.

The second and more serious area of concern, as it pertains to aircraft damage and loss, is the birdstrike hazard to low level jet operations. An awareness of the hazard, coupled with conscientious flight planning, will result in reduced risk. For example, airspeeds should be reduced during periods of increased bird activity. Shore lines and other areas of gull activity should be avoided. Aircrew should wear helmets with visors down, both day and night, and if practical, keep landing lights on and the windscreen heated. Knowing where primary migration routes are located, when they are active and where waterfowl or gull concentrations exist, will facilitate low level route planning. Accelerated climb to above 3,000 feet AGL, bird information passed over ATIS and included with weather forecasts are additional methods of countering the bird threat. With the introduction of the A-10 and the increased emphasis on TAC low level operations, the birdstrike hazard has taken a quantum jump.

The cost of modern jet aircraft and increased nap of the earth missions combine to produce a situation of mounting concern. Nations throughout the world are engaged in birdstrike countermeasures. We can mutually benefit from shared experience but the resolution of any problem must start with a basic understanding and thorough awareness of its magnitude. Do not underestimate the ability of a bird to spoil your day. ■

A Hole That Is Not A Hole

Airborne Weather Radar Interpretation

CAPTAIN THOMAS E. SIELAND
HQ Air Weather Service
Scott AFB, IL

■ On 4 April 1977, Southern Airways Flight 242 crashed near Rome, GA, killing 72 people. The National Transportation Safety Board concluded the following factors contributed to the accident: The severe weather encountered by Flight 242 near Rome, GA, the extent of the flight crew's knowledge of the severe weather conditions before the encounter, and the information provided the crew concerning those conditions. Survivors of the crash verified that both engines surged, stalled and then quit while the aircraft was penetrating a thunderstorm with heavy rain. In addition to the testimony of survivors, the cockpit voice recorder indicated the crew flew the aircraft through what they thought was a hole in the line of thunderstorms; however, it is possible that they misinterpreted what they saw on their radar. This article summarizes what might have happened, and more importantly, what could happen to you under similar circumstances.

Mr. Jim Metcalf of Georgia Tech University analyzed radar data from the National Weather Service's (NWS) 10 cm storm detection radar at Athens, GA, and produced Figure 1. It was at this time that the captain and first officer were discussing the hole in the storm. As you can see, this is an extremely intense thunderstorm with maximum reflectivity in excess of 50dBZ. Generally, at this time of the year and in this geographical area, we consider storms with maximum reflectivities greater than 50-55dBZ as severe storms. How could the crew see a hole in such a large storm and then attempt to fly through it? Read on.

Heavy precipitation (areas of high reflectivity in Figure 1) will absorb and scatter transmitted electromagnetic energy. We call this *precipitation attenuation* and it varies according to the wavelength of the radar. A 10 cm radar, such as the NWS radar at Athens, GA, will not experience much attenuation. However, a 3 cm radar, like the airborne weather radar on-board Southern 242, can experience severe attenuation. To demonstrate, Mr. Metcalf calculated the probable attenuation values for a 3 cm radar, applied them to the values in Figure 1 and developed a synthetic display of 3 cm radar data (Figure 2). Note how attenuation makes the storm appear narrower across the strongest part of the echo.

In addition, iso-echo circuitry was apparently being used by the crew of Southern 242. Iso-echo circuitry is meant to aid the radar operator/interpreter by identifying areas of *high* reflectivity. When the returned signal exceeds a preset threshold, iso-echo reverses the signal and displays it as if there were no signal. As a result, the most intense portion of a storm appears on the scope as a "hole" in the echo. In reality, these holes are heavy rain and/or hail shafts in a thunderstorm; areas that pilots should definitely avoid. Therefore, one might be fooled by returns that combine the effects of iso-echo and losses due to precipitation attenuation. This may be what happened to Southern 242.

Figure 3 shows what the on-board radar would look like if the
Figure 2 are representative.
can see, the aircraft track go
through the iso-echo hole in
appears to be the narrowest
of the storm. When you com
Figures 2 and 3 with Figure
can see how the combined e
attenuation and iso-echo circ
can be misleading.

In later correspondence, M
Metcalf also states: "The pr
qualitative conclusion . . . is
the crew was using their rad
purpose beyond its intended
capabilities. The X-band (3
weather radar is a weather
avoidance radar, and, if use
anything more than that, sho
used with great care and ma
data input from ground stati
possible, pilots should use P
Metro-Service (PMSV) to c
Air Weather Service unit ha
storm detection radar. Discu
magnitude and extent of
thunderstorm activity before
any decisions about
circumnavigating thundersto
you may find yourself penet
thunderstorm like Flight 242

Another incident that poin
the problems that can arise f
of iso-echo circuitry occurre
weather reconnaissance miss
While they were penetrating
typhoon and using airborne
the copilot told the AC that
was a hole in a storm cell, a
should head for it. The weat
on the crew overheard the
conversation and realized th
echo was on. He asked the
to flick off the iso-echo so t
copilot could see that there

't a hole in the large storm cell. ly appeared to have a hole use *iso-echo circuitry cancelled he heaviest portion of the cell.* e don't know for sure what happened on 4 April 1977, here is, of necessity, some lation. For one thing, we don't the configuration or tional status of the on-board However, the study does rate what could happen if you ot careful. Evidently the ern Airways' crew terpreted what they saw on adar. Maybe they forgot that ho was on or even worse may ve completely understood so-echo does. Don't let this n to you. ■

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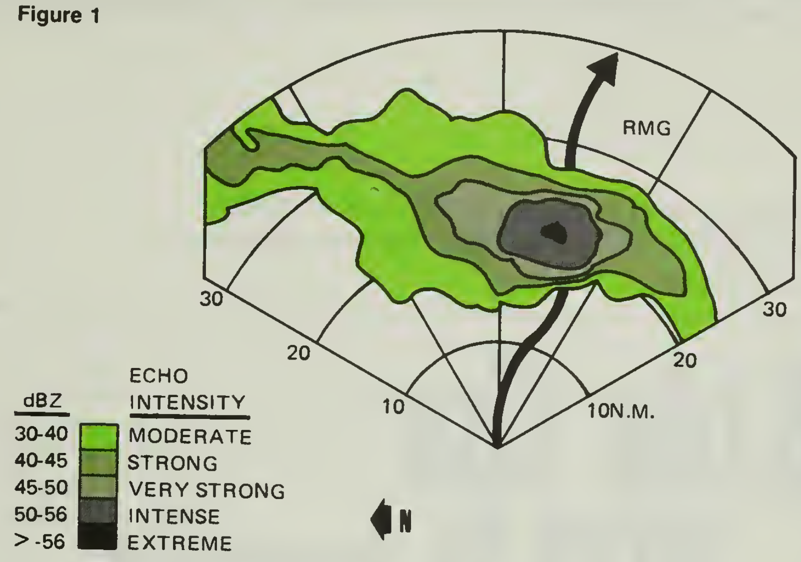
James I., 1978: "Southern Airways Flight 242: of Airborne Weather Radar," AWS/TN-78/ s. Reprint of paper he presented at the e on Analysis and Forecasting and Aviation gy of the American Meteorology of the Meteorological Society and the National ssociation, October 16-19, 1978, Silver aryland.

THE AUTHOR

Thomas E. Sieland is the Assistant equirements Division, DCS/Systems, Weather Service, Scott AFB, IL. He in the Air Force in January 1960 and a B.S. in meteorology from Florida iversity under the Airman Education missioning Program in 1967. Sieland was commissioned through 968. His weather officer nts include Ft Rucker, AL, Tan San , Vietnam, and Scott AFB, IL. In Captain Sieland has received his meteorology from the University of in 1971, and a PhD in meteorology as A&M in 1977, all under the of Air Force Institute of Technology programs.

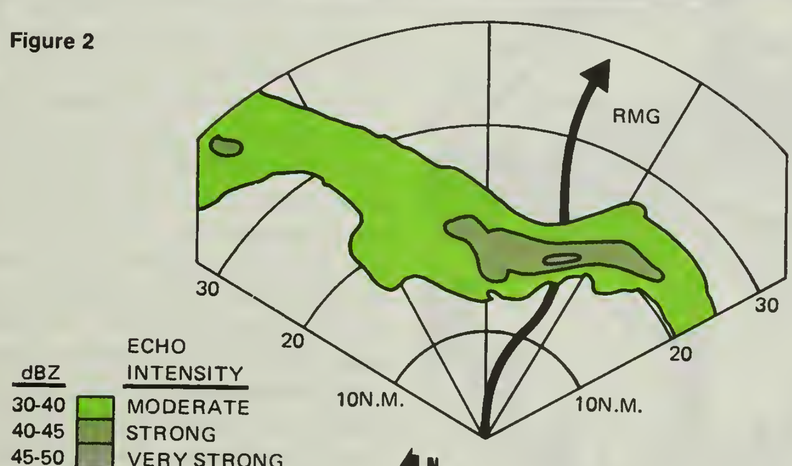
Figure 1



This drawing shows aircraft track through worst part of storm. Compare this figure and Figure 2, below, with true configuration of the storm in Figure 1.

Figure 3

Figure 2



This is the final of three installments of Major Weir's article about helicopter flying in all kinds of conditions.

Ride the WILD horse

Conclusion

MAJOR CHARLES O. WEIR

Landing Site Selection

■ When selecting a landing site, weigh the advantages of different type areas, i.e., ridges, hilltops, saddles, knolls, valleys and canyons. The velocity of the wind will be one of the first and most important factors to consider. If the wind is relatively calm, it is usually best to select a hill or knoll for landing, where full advantage of the wind effect may be realized. Extreme care must be exercised when light winds exist (0-5 knots) because they are usually variable, difficult to evaluate, and may be very detrimental if a downwind condition is encountered during the takeoff or approach.

Whenever possible, approaches to ridges should be planned along the ridge or at a slight angle rather than perpendicularly. This procedure will help avoid downdrafts during the final phase of the approach and provide a better abort route, should an abort become necessary.

In planning the approach, consideration must be given to
of factors. Wind must be
to the best advantage. Con
stacles in selecting the best
route. *Weigh and consider c*
carefully. Keep the top of
ing area in view at all tim
the approach.

Landing Site Evaluation

A complete landing site e
must be made to assure a s
ation from unfamiliar or u
sites.

In performing a landing s
ation, execute as many fly-l
necessary to obtain all the
tion required. Make at least
reconnaissance and one lo
naissance before conducti
ations into a strange landing

High Reconnaissance

Prior to the first landing in
area, the pilot should circle
to determine the general ter
acteristics. The high recon
should be flown at an altitu
proximately 300 feet al
ground to permit observati
intended landing area and al
approach and takeoff route
high reconnaissance, th
evaluate the wind for dire
velocity. Movement of tree
bushes, etc., will assist th
making the wind evaluation

To determine drift, a re
pattern flown around the
landing area should be suf
determine drift and wind
Drift and estimated wind
may also be determined by
a constant airspeed over th

ı on each of the four cardinal lings.
hroughout the entire landing site uation process, note the location intensity of turbulence in the im- iate area. Carefully observe the acles in the vicinity of the land- area. Note their estimated height location with reference to best oach and departure route.
onsider the landing area. Check uitability of landing. Such items ope, rocks, stumps, undergrowth marsh land must be taken into ideration to determine if the heli- er can be landed at the selected

ieck the pressure altitude to de- ine whether it is the same as that for flight planning. (To accom- this, set 29.92" hg in the win- of the altimeter and read pressure de directly from the instrument.) k free air temperature. Deter- if power lines, cables or similar cles are in the immediate land-

never select a ling site for con- ence only, but consider elevant factors in the rmination.

ea or near the selected approach

ver lines are very difficult to om the air and a thorough search pporting towers or poles should de. Should evidence of power be found, proceed with the ut- caution until positive location is established. Select the most desirable approach and takeoff routes. Such routes should have the fewest obstacles yet be consistent with the wind direction and velocity.

Ensure that landing areas are of sufficient size to permit safe landing and takeoff under the prevailing operating conditions. In determining size of landing area, consideration must be given to operating weight, wind direction and velocity, obstacles, temperature, and other variables which influence helicopter performance. *Remember, never select a landing site for convenience only, but consider all relevant factors in the determination.* Prior to descending for the low reconnaissance, determine the maximum power available. This will provide the pilot with an expected performance capability of the helicopter should any unusual or unexpected conditions occur during the low reconnaissance.

Low Reconnaissance

The low reconnaissance is flown in the direction determined to be the best route during the high reconnaissance. Accomplish the following during the low reconnaissance. If terrain, weather, and all other factors are favorable, fly a rectangular pattern at approximately 50 to 100 feet above all obstacles and at an airspeed commensurate with flying safety for the existing conditions. Recheck the size, slope and obstructions in or surrounding the landing area. Recheck the wind for the intended landing area. This recheck is necessary in order that any changes in direction or velocity may be noted subsequent to the high reconnaissance.

Power Check

The importance of the power check cannot be overemphasized. The power differential determined in this check is the final factor for consideration in the pilot's analysis as to whether a safe approach and landing can be made. A power available check should be performed any time a remote area operation or hoist recovery is anticipated. When not prescribed in the flight manual the power available check should be accomplished as follows: using maximum rpm, first establish the preselected condition, i.e., airspeed, altitude and OAT for which power has been precomputed, then increase collective to ensure that precomputed power is available within existing engine or transmission limitations. Maintain rotor speed as prescribed by the flight manual during the check. The power available/allowable check should be performed as near as possible to the same pressure altitude and OAT conditions as that of the landing or recovery site. This power available check may be performed either en route to or at the recovery site. Should precomputed power not be available, engine topping may be required. Compare the power available against that computed for hover to ensure that there is sufficient power available to complete the landing or recovery.

It should be remembered that the power check is only a guide to be used by the pilot to supplement and cross-check his flight plan and assist him in the determination of whether

Ride the WILD horse continued

a safe landing can be made.

Hovering and Landing (Operational)

Bring the helicopter smoothly to a one- to two-foot hover. Low hover requires a minimum of power, reducing the possibility of rpm loss and subsequent settling. Should settling occur, the helicopter will touch down more gently from the low hover. Land as soon as possible. Decrease the collective pitch slowly while maintaining maximum rpm until the entire weight of the helicopter is supported by the landing gear. Maximum rpm should always be maintained until it has been determined that the surface will support the helicopter.

Consider the rotor diameter and be constantly alert to ensure adequate rotor clearance. The angle of descent over an obstacle must be sufficiently high to ensure rotor clearance. Exercise extreme caution when hovering in confined areas to avoid swinging the aft or tail rotor into obstructions.

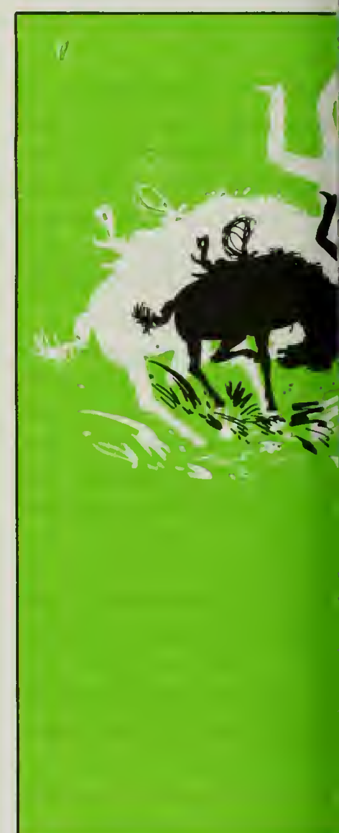
The importance of preflight planning for any helicopter flight and particularly operational helicopter flights cannot be overemphasized. Prior to any helicopter departure for a remote area or site, power required and power available upon arrival must be computed. Such items as weather upon arrival, direction and velocity of the wind, en route turbulence, and adequacy of landing site must be carefully analyzed before departure. Refer to the appropriate Flight Manuals for complete details in preflight planning and proper use of performance charts.

Turbulent air is encountered at low altitudes in the vicinity of irregular or mountainous terrain. The degree of severity is directly related to three main factors—thermal effect, wind velocity, and the contour of the terrain. The general effects of a strong wind over a mountain barrier are an accelerated wind speed and reduced pressure over the crest, with turbulence and relatively low pressure on the lee side. The increase in wind velocity over a crest is likely to be greater when the wind is at a right angle to the ridge. Isolated peaks tend to create severe turbulence by wind swirl effect rather than increased wind velocity.

The importance of the power check cannot be overemphasized. The power differential determined in this check is the final factor for consideration in the pilot's analysis as to whether a safe approach and landing can be made.

With a wind velocity over a mountain barrier, downslope wind usually occurs in the lower altitudes on or near the lee slope. Contour has a definite effect on lee flow pattern. The lee flow of air over a gentle contour provides the simplest pattern and the least turbulence, although downdrafts are often severe on the lee side of the crest during periods of high wind velocity.

In winds of approximately 10 knots and higher, turbulence will usually be found near the ground on the downwind side of trees, buildings or hills. The turbulent area is always relative to the size of the obstacle and the



velocity of the wind. You c expect it close to, and on the side of a barrier, such as trees ings or hills.

Turbulence can be enco on bright sunny days over the of two dissimilar terrain f such as a ramp bordered by s

ary cause of this type of turbu- e is the vertical air currents pro- d by the heating effect of the sun. eneral procedures and precau- are recommended when flying gh winds and/or turbulent con- ns. You should make frequent ks of direction and estimated velocity during flight. If severe lence is encountered, reduce eed and land as soon as possible. sing mountain peaks and ridges w altitude under windy or tur- t conditions can be very danger- The safest crossing can be made ying downwind. This will en- that downdrafts will be en- tered after ridge crests have crossed. If this is not practical, de should be increased pro- onately before crossing such .

e minimum altitude for flying a high ridge depends on the velocity, type of terrain, and egree of slope. In strong winds steep slopes, severe turbu- may always be expected. Plan flight to take advantage of the fts on the windward slope and ver possible avoid the down- prevalent on the lee side. In winds it is possible to encounter drafts of sufficient intensity to full power inadequate to pre- xtreme loss of altitude.

u should always exercise ex- caution when flying in canyons alleys; assure adequate terrain nce before entering such an lways maintain an "out"; plan , and at all times know which turn in event of an emergency. e upwind slope whenever pos- to take advantage of updrafts, and in the event of a forced landing, always be in a position to autorotate downhill and into the wind.

Winds below 35 knots can normally be used to an advantage during takeoff or approach, but in higher winds turbulence may cancel out any wind advantage.

Watch for rpm surges during turbulent conditions. Strong updrafts cause the rpm to increase, whereas downdrafts cause the rpm to decrease. Usually the surges are small and the rpm will correct itself; however, if the rpm begins to approach the maximum limits, corrective action must be taken.

Fly as smoothly as possible and maintain attitude control. Prevent excessive airspeed build-up to avoid the possibility of blade stall.

Avoid flight in or near thunderstorms. Dangers to be encountered in thunderstorms include hail, freezing rain, lightning, swirling winds and vertical air currents which have been known to be strong enough to exceed the structural limitations of the helicopter. If thunderstorms cannot be avoided, land as soon as possible and await passage. Use extreme caution during helicopter shutdown if gusty or high winds exist.

Constant study, planning, maintaining top physical and mental alertness — remembering the hazards — coping successfully because you are prepared will certainly enhance longevity.

Providing all of these procedures are used, takeoffs as defined in the appropriate Dash Ones can be utilized to effect safe departure from any of these areas. When possible, a power to hover check should be made prior to any particular type of takeoff.

Conclusion

Only through study of these factors and joining them into our daily practice can we attain the skills necessary to arrive at a "go or no go" situation. A reading file should be maintained in each Helicopter Operations Section so that pilots can familiarize themselves with factors governing their daily flying duties. Your Dash Ones have a wealth of information. Talk with your base weatherman frequently; he can fill you in on a lot that normally doesn't come out during your routine weather briefing on your '175. Study as you fly — develop the habit — it can save your neck. It's up to you. Constant study, planning, maintaining top physical and mental alertness — remembering the hazards — coping successfully because you are prepared will certainly enhance longevity.

The successful mountain pilot is a product, like a gem that is polished to a shining finish. He will sparkle in his difficult task. It takes work, supervision, study, planning and sound application of all these to attain the razor edge of sharpness. Would you supervisors settle for anything less when it comes to dispatching your helicopter to a landing area the size of a postage stamp at 10,000 feet? Do we want to "Ride the Wild Horse" or shall we tame him — with knowledge?

It is our choice. ■

X-COUNTRY NOT

■ Bad guys are traveling! The weather Gods and broken airplane gremlins didn't get to us the last trip and we were able to evaluate 13 different facilities. Before listing the good guys, we'd like to pass out some items which popped up frequently during the trip.

INFORMATION

IFR Supplement—This book is the bible that throttle-benders use to decide if your facility is suitable for their machine. The intent of the Supp is to list available equipment and facilities, but also to pass on information necessary for the aircrew to safely arrive and depart the airdrome. As we roamed the CONUS, we noticed a tendency to stuff more and more info into the book. Sure, much of it is necessary, but some is not! Our only point is that maybe it's a good time for airfield management folks to take a hard look at their advertisement in the IFR Supplement. Is everything a required item? Are hours of operation versus transient hours versus other hours confusing? Sometimes the disparity is unavoidable but on occasion, a slight time shuffle will line up operating hours to prevent confusion. May be worth looking into! Like we said, take a look at your entry and empathize with the crew member who has to digest it all in only a minute.

Transients versus transients—At several places we stopped, the people really had their act together until we played devil's advocate and said "O.K., you took good care of us, but now let's say we're a broken C-130 and we have five or six enlisted crew members with us. Show us where they can get a meal and adequate crew rest before we blast out of here tomorrow." At times we were disappointed in the services and facilities that we were shown. POINT—crew members come in all different sizes, shapes, colors, ranks and sexes! If you're looking at your own house to see if it's in order for providing good service to transients, remember that the service needs to be good for *all* crew members. Often, a loadmaster or flight mech needs a good crew rest facility much more than the pilot or nav since they may have spent extra hours working cargo
a sick bird. Take care to
good transient service ac
board.

Retained Awards

HILL AFB, UT

Check the IFR Supp for
about runway winds! High
high terrain and mucho
make Hill AFB a place to a
and depart with caution. Ba
facelift is turning out a t
facility and personnel are
to provide good service!
the good work!

KIRTLAND AFB, NM

Same kind of terrain an
problems as Hill but add
airfield cautions (airlines
of little airplane folks). Kir
folks and Base Ops do a
Leave yourself some extra
get to and from billeting
it's on Kirtland East and o
20-25 minute ride each
facilities super.

RANDOLPH AFB, TX

Take some extra gas
you may get an early desc
some low altitude vectorin
way in. Randolph conti
provide super service and

nsients. Call ahead for reser-
s!

SDALE AFB, LA.

y one runway has caused
arrival delays at times. Super
akes it a good east-west en-
gas and food stop!

PARD AFB, TX

of local and student traffic
Sheppard a heads-up place!
ct TA does an outstanding
d facilities are super. Good
er or RON!

LEY ANGB, CO

her high altitude and terrain
The Denver traffic also
watching. Buckley TA and
lks still bend over back-
to provide the best possible
whether you're staying or
' on. It's always been a
e to visit—wish there were
laces that. . . . Nuff said!

LIN AFB, TX

on the beaten path, but you
pect a good turn from the
folks. Laughlin service and
s continue to be some of
t.

dditions

AFB, OK

Probably the hardest trying outfit I've seen, Altus has a brand new Base Ops and is obviously anxious to serve. Now that RG has drawn down, maybe Altus will pick up the reputation for a good X-C stopping place. Glad to have you!

WURTSMITH AFB, MI

We landed in a snowstorm with sub-zero temps and still received super service. TA and Ops folks will take good care of you and the RON facilities are good. A long way to an alternate, but next time you might try the northern route!

WILLIAMS AFB, AZ

UPT and the Phoenix area traffic require the moving eyeballs to be used in and outbound. Willy has a somewhat limited transient ramp so if you have a many-motor or a flock of machines, you may want to call ahead. Other than that, the personnel at Willy will take super care of you. Welcome to the list!

That wraps up the latest trip! Keep the feedback coming 'cause we use aircrew comments as an indication of where we need to schedule to. Write Rex Riley, AFISC/SEDAK, Norton AFB, CA 92409. FLY SMART! ■

THE

REX RILEY
Transient Services Award

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AK
PETERSON AFB	Colorado Springs, CO
RAMSTEIN AB	Germany
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
TORREJON AB	Spain
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
NORTON AFB	San Bernardino, CA
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
CARSWELL AFB	Ft. Worth, TX
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayeteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND
VANDENBERG AFB	Lompoc, CA
ANDREWS AFB	Camp Springs, MD
PLATTSBURGH AFB	Plattsburgh, NY
MACDILL AFB	Tampa, FL
COLUMBUS AFB	Columbus, MS
PATRICK AFB	Cocoa Beach, FL
ALTUS AFB	Altus, Oklahoma
WURTSMITH AFB	Oscoda, Michigan
WILLIAMS AFB	Chandler, Arizona

For years we have been pushing the "If it doesn't look right, take it around" syndrome. But like Junior, who won't pay attention to anything the old man says, pilots sometimes have to learn the hard way. Here is a DC-8 Captain's report on an experience of his. If you believe it, you may not have to do it.

A Captain's Report

■ This incident occurred during vectors for a localizer approach to 5R with a side step to 5L. WX 8 2½ R-wind N 10 kts. HDG 240° at 7,000. Given a turn to 330° descend to 4,000. In the turn and through 6,000 the controller says, "You are 3 miles from the fix, can you get down in time if I turn you on now?" I tell the F/O to answer "yes," and we are given a turn to 030° descend to 2,800—intercept and cleared for the approach. Call TWR at the fix.

Sometime during this exercise, the S/O gets a new ATIS which he puts on the card for us—viz is now 1½ S-F. To get down, I have gone to flaps 25° and gear down. In the turn and descending at a good rate. Too good as a matter of fact because out of 4,000 and going down, the GPWS goes off. Startled, we all look around. It's obviously excessive rate. In that momentary confusion, I go through 2,800 and stop it at 2,100. The controller calls and tells us we are there and to go back to 2,800. I'm already going. Just reach 2,800 and there goes the fix. I'm mentally kicking myself when it registers that the F/O is telling me that 1½ is illegal for 5L and he is right. Still above MDA for 5L and there are the

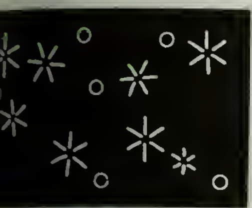
I've been behind it ever since I accepted that turn on. At least three times now, things have occurred that called for a missed approach. Why am I here?

approach lights for 5R. A very sloppy approach, to say the least. I've been behind it ever since I accepted that turn on. At least three times now, things have occurred that called for a missed approach. Why am I here? The visual acquisition of a se bright approach lights in visibility is one thing, but acquisition of runway ligl in limited visibility is quite another. Our speed as I flaps 35° is about 150/15 stay at MDA until we see runway. Visibility not bac approach, but worse ove field. When we do see th runway, take full flaps ar power to get down, it is a too late. I touch down at 2,000 feet down the runv stop all right, but this is r run an airline!

For days now I've bee myself and asking mysel I'm sure the F/O was sha head all the way down. A of errors. I dug my own h that's for sure. We tend t more, I think, with a freig we would with passenger board. We'll take a little r turbulence or make a ste descent. The cargo palle mind; we'll also, at times a close-in turn from a litt high just to be cooperativ can even cooperate ours right out of the ballpark. I have and surely should h no and made a missed a but I didn't. Once I accep turn on I felt obligated. P This was an illegal appro lower VIZ was received c the LOM, and once the G went off, I never did catch only wise thing I did was MDA until runway in sigh rest I'd like to forget, but Quoted in *Air Safety Rev*

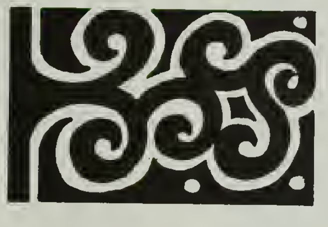
PS TOPICS

AKY SPARE



The F-4 pilot led his flight into ACM tactical intercept. After ob- ing a tally on his adversary, he ed into a sustained 5G turn; how- before he could complete the agement, he experienced tunnel on and temporary loss of situation reness. The attack was broken and an uneventful RTB and land- accomplished. Cause of the in- it was a faulty G suit valve and aking G suit. It seems that this the pilot's spare suit that had improperly stored at his resi- e. How about yours? – Major Harrison, Directorate of Aero- Safety.

WATCH THE T-39s!



An S-3A and a T-39D were parked on a transient line, tail to tail, approximately 80 feet apart. The T-39 had its gust lock set.

S-3A starting procedures require one engine to be at 80 percent power in order to start the other engine. After the S-3 was started, observers noted that the T-39 rudder was deflecting rapidly back and forth until it finally deflected hard left. The pilot of the S-3 taxied out and took off, unaware of any incident.

Inspection of the T-39 revealed that the torque tube had failed due to excessive loads on the rudder from the S-3 exhaust blast. The T-39 with its lightweight flight control surfaces and mechanical linkage is considerably more susceptible to gust load damage than tactical aircraft.

At its home base the T-39D is parked with 100 feet separating aircraft. All facilities servicing T-39 aircraft are advised of the T-39's susceptibility to structural damage of the rudder due to side loading. Care must be taken in parking T-39's in proximity to other aircraft where jet exhaust will strike the empennage. – (USN *Weekly Summary*.)

DLE

football season the word "hud- is used to gather your group d you in an attempt to win or ve the game. In cold water sur- "huddle" may help save your

rvival in cold water depends on things. Thin people usually are come by the coldness of the before large people because in body cools at a much faster

imming or treading water will your body to cool 35 percent than remaining still. The nproofing technique" requires g the head into the water, and ause a person to cool about 82 nt faster than if floating with ad out of the water.

"average" person, wearing clothing and a personal flota- evice (life preserver) may sur- ½ to 3 hours in 50 degree water by remaining still. This survival time can be increased considerably by getting as far out of the water as possible and covering your head. Getting into a boat or anything else that floats can be a real lifesaver.

It is important to remember that cold water conducts heat away from your body many times faster than air. Your life preserver will keep you afloat even though you may be unconscious. Remaining still and, if possible, assuming the fetal position will decrease your body heat loss and increase your survival time. About 50 percent of your body heat is lost from the head so it is important to keep the head out of the water. Other areas of high heat loss are the neck, the sides and the groin.

If several of you are in cold water together, you can "huddle" close, side by side in a circle to help preserve body heat.

Of course there comes a time of decision making when you are in the water. Knowing that body movement causes you to lose body heat at a greater rate, do you leave your position and attempt to swim to an object or shore? Distance on the water is very deceptive. We recommend that you stay put, unless you are absolutely sure that you can make it to shore, or that there is no chance for rescue. – Courtesy *Aviation Digest*, March 1979. ■

THE COLOMBIAN TROPHY
Symbolic of excellence in military aviation safety, the Colombian Trophy for 1978 was awarded to the 401 TFW. The wing flew 9,700 sorties and 14,400 hours in 1978 with no accidents. This achievement was attained while the wing conducted realistic combat training in high performance tactical fighter aircraft.
401st Tactical Fighter Wing, USAFE

THE SICOFAA AWARD
Awarded by the System of Cooperation Among Air Forces of the Americas for excellence in aircraft accident prevention. For its many achievements while flying 13,600 accident-free hours in 1978 in three different type helicopters and three models of the C-130, the 403d was selected the winner of the SICOFAA Trophy from among 10 nominees.
403d Rescue and Weather Reconnaissance Wing
Selfridge ANG Base, MI (AFRES)

THE KOREN KOLLIGIAN, JR. TROPHY
Major Fowler exhibited extraordinary skill while flying as an aggressor pilot in the F-5E. At 20,000′ and 1.2 mach, the aircraft canopy shattered, and flying plexiglass seriously injured his right eye. Nevertheless, Major Fowler successfully recovered the aircraft despite pain and loss of vision in one eye.
Major Raymond D. Fowler

THE MAJOR GENERAL BENJAMIN D. FOULOIS MEMORIAL AWARD
Presented by the Order of Daedalians, the National Fraternity of Military Pilots, the Foulois Award recognizes the aircraft accident prevention program judged to have been the most effective of all major commands. SAC had only one Class A aircraft mishap while flying more than one-third of a million hours, worldwide.
Strategic Air Command

SAFETY TROPHIES for distinguished contributions during 1978

CHIEF OF STAFF INDIVIDUAL SAFETY AWARD

Presented to Air Force personnel who made significant contributions to safety during the previous calendar year.

MR. ARLIE E. ADAMS
AIR FORCE LOGISTICS COMMAND

Mr. Adams' efforts resulted in a number of accomplishments including management of system safety engineering analyses for hot refueling and combat turnaround of tactical and strategic aircraft which increased combat readiness and sortie surge capability of the USAF

CAPTAIN CHARLES F. PLOETZ
UNITED STATES AIR FORCES IN EUROPE

Captain Ploetz, as explosives safety officer for USAFE improved explosives safety criteria for hardened aircraft shelters and runway and taxiway protection which resulted in greatly enhancing the operational efficiency of USAFE

SENIOR MASTER SERGEANT LEON B. SEXTON
AIR FORCE COMMUNICATIONS SERVICE

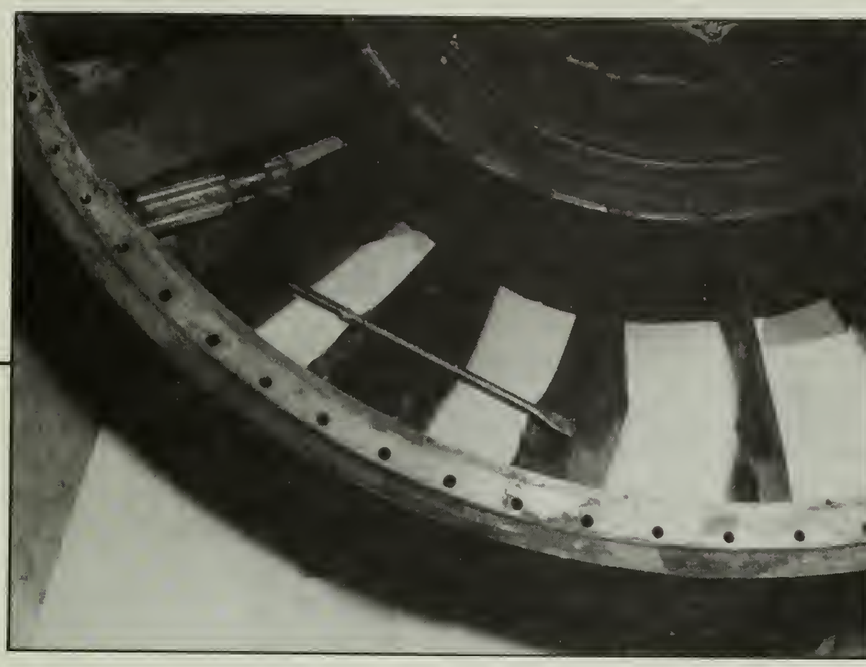
As safety superintendent for AFCS, SMSgt Sexton provided leadership in safety management for more than 700 Air Force units and 60,000 people. He contributed to reducing ground accident fatalities to the lowest in command history.

CAPTAIN GERALD P. BUCZEK
AIR TRAINING COMMAND

As safety training officer at Lowry Technical Training Center, Captain Buczek planned, developed and implemented programs that resulted in cost reductions while enhancing the Air Force's safety program management capability. ■

FOD For Thought

AJOR JAMES GILLESPIE, CF
rectorate of Aerospace Safety



Foreign object damage (FOD), e of the most expensive and oublesome problems in the life cle of aircraft turbojet engines, s cost the USAF more than $25 llion in the past two years. The ntrol of FOD is the primary ncern of everyone who works in d around jet engines, from the n on the ramp to the crew in the ckpit. This is one area where tra effort will pay off in mediate savings through reduction lost resources.

For convenience, FOD can be ided into two categories. One is t type over which we have very le direct control: birds, slush, w or ice ingestion and the mingly inevitable loose screw in intake, to name but a few. It is other category, however, which will address here. That is, the vious individualized contribution de by a careless or unthinking son who through complacency, ughtlessness or circumstance, s to satisfy the ravenous appetite a howling compressor.

n the past few months, we have erienced several instances of sons unwittingly contributing to feeding problem. The following mples, unfortunately, are typical:

• As an aircraft was being parked transient base, a lineman went ler the aircraft to remove the gear s and pitot cover from the wage compartment to pin the raft. In the interim, the tower ed the pilot to move his aircraft nother spot. Unorthodox hand nals from the cockpit resulted in ewildered lineman attempting to hand the pins to the rear seat occupant. The back seat pilot realized it was wrong to reach for the pins with the engines running but the circumstances influenced him to do so. The pitot cover was ingested in the right intake.

• During engine run-up on the runway, the pilot felt the left engine "chug" slightly passing 85 percent rpm. Number two engine flamed out at 85 percent rpm. Investigation following ground abort, revealed portions of the northwest high altitude approach plate booklet in the right engine and the northeast booklet in the left engine. This may seem reasonable if the runway direction was southerly, however, it is not conducive to long engine life. The occurrence was attributed to the previous mission. When the canopy was opened after clearing the runway, the FLIPs, which became lodged behind the ejection seat during BFM, fell out and were sucked into each intake.

• An aircraft was positioned in the dearming area configured with an empty SUU-20. The load crew chief approached the aircraft from behind the right intake to insert the pylon safety pin. The wind caught the streamer attached to the pin and carried it to a position near the intake. The airflow pulled the safety pin from the hand of the load crew chief and it disappeared into the right engine.

• An aircraft was being run up following an engine change. The technician finished inspecting panels on the underside of the aircraft and exited the work area between the left main gear and the left intake. As he passed near the intake, his hardhat, complete with ear protectors, swiftly departed his head and vanished up the intake, prompting him to wonder why he had not fastened his chin strap. And, on and on it goes. . . .

It can be said with some assurance that as long as we have people working in and around jet airplanes, the potential for personnel-induced FOD mishaps will exist. Our job as workers and supervisors is to ensure strict adherence to established procedures. An increased awareness and a healthy respect for the dangers posed by a jet engine duct are a must. Continuation training and increased situational awareness by all personnel are the backbones of an effective FOD program, and the elimination of carelessness and complacency is an essential step. FOD can be beaten. Let's do it! ■

FLYING FOSSILS

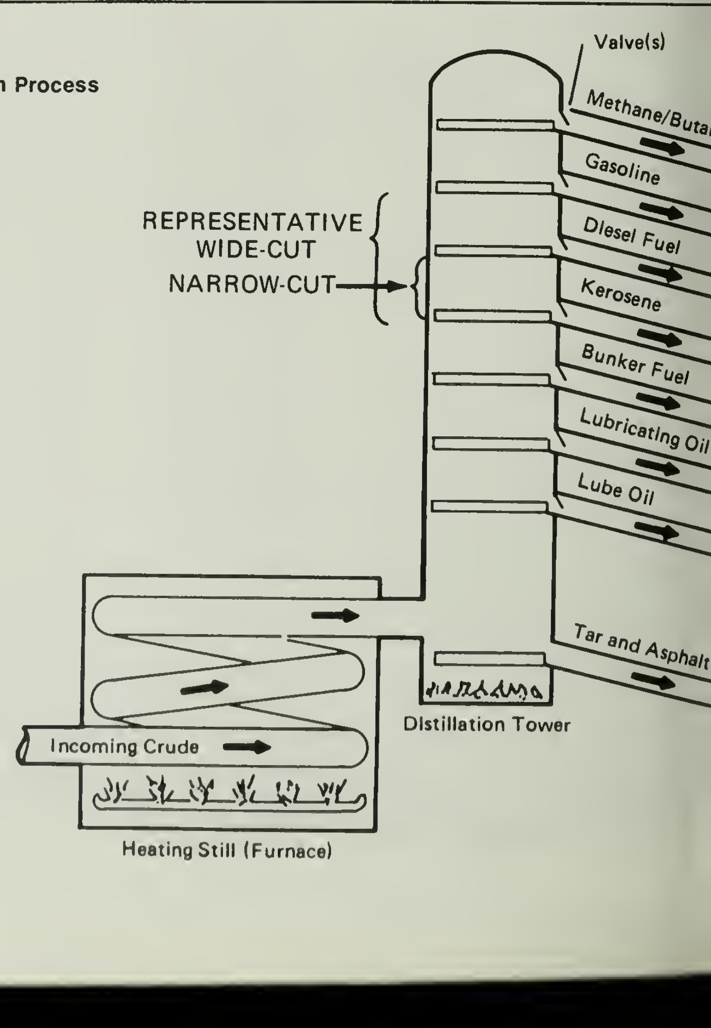
J. R. HENNINGFELD
Editor *DC Flight Approach*
in collaboration with
Technical Consultants
A. T. Peacock,
Power Plant Engineering
and C. E. Brown,
Flight Operations

Back in the old days, the real old days, like millions of years ago, society consisted of some pterodactyls and some very large land creatures like the triceratops, brontosaurus and a placid, graceful swamp dweller, diplodocus. At about the same time, the neighborhood began to grow—really grow! Ferns shot up to 90 feet or more, trees developed gigantic girths and heights; vegetation in general floruished on an unprecedented scale and inflation was very, very low. Then something happened. Perhaps it got very cold one night and just didn't warm up in the morning, causing all these creatures and plants to die off. Whatever the cause, all these fellows, along with the giant vegetation, simply settled into the ground, and there they sat, brooding for eons with very little to do but decompose. After millions of years the creatures and jungles slowly turned into pools of messy ooze deep in the ground, furnishing us with what we now call crude oil.

■ Crude oil and unrefined petro are synonymous. They are a mix of organic compounds that are primarily hydrocarbons. Hydrocarbons are a mixture of t elements: hydrogen and carbon. Hydrogen is a highly flammable colorless and odorless gas. Carb comes in two forms, crystalline (solid) or non-crystalline (soot). When hydrogen is attached to carbon, you have the essential ingredient for producing petroleu products.

Hydrocarbons come in a variet molecular weights which determ the products to be extracted from crude. For instance, the very ligl

Figure 1. Petroleum Products Separation Process

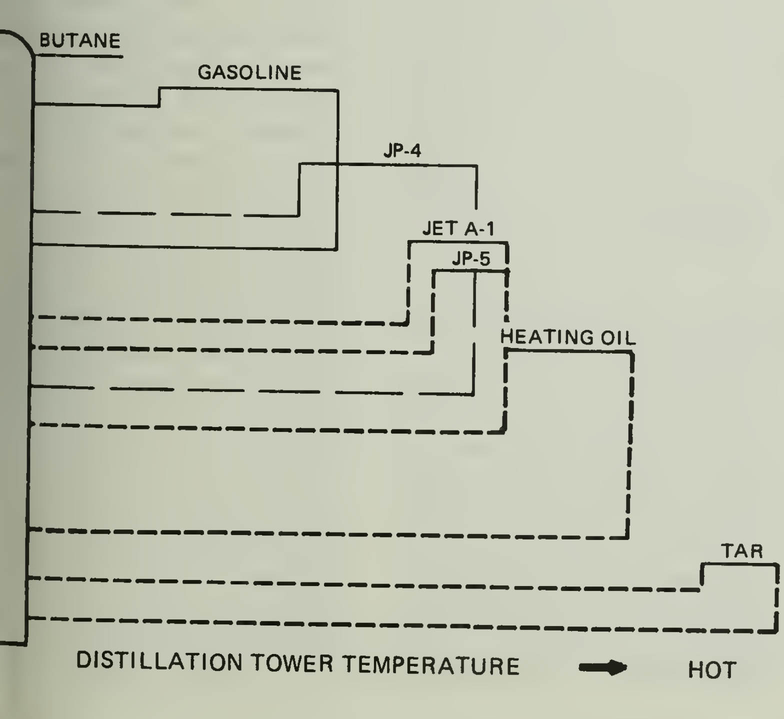


ocarbons will refine into bottled s while the very heavy will l products like tar and asphalt. the refining process, crude is ped into a separator where the s are drawn off, leaving only iquid crude, which is then ped to refinery storage areas. this point it is forced into a ce, or heating still (much like used in making "moonshine," on a much larger scale), where heated to the boiling point re 1).

hen liquids boil they give off rs, and crude oil is no otion. From the heating still, all rs flow into a tall distillation tower, cooling as they rise. Each type of vapor rises only as high within the tower as its physical properties will allow. (It should be noted that the term "boiling point" is generally correlatable with molecular weight, but that some particles having the same molecular weights will have differing boiling point temperatures.) Lightweight hydrocarbons vaporize first and rise very nearly to the top of the tower where they cool and condense into liquid form. The progressively heavier hydrocarbons do the same thing, but condense at lower heights within the tower. When any of the vapors condense, the resultant liquid settles on a collector tray located at a height in the tower corresponding to the predicted condensation point of that specific hydrocarbon. The first vapors to boil off are the ultralight ethane, butane and propane gases. Next are gasoline vapors, followed by hydrocarbons of the distillate group from which kerosene is extracted. This group includes the various types of jet fuel. Heavier hydrocarbons vaporize last to form oils for lubrication, fuel for steam generation plants, and finally, solid lubricants, tars, asphalts and fertilizers. Over 40 percent of all U.S. petroleum use is within the gasoline group of hydrocarbons. The distillate group of hydrocarbons, which includes those used to make kerosene for jet engine fuel, comprises an additional 24 percent of U.S. petroleum use. Jet fuel alone consumes 6 percent of total petroleum use in the United States.

This article is actually concerned with the kerosene section of the refining spectrum, from which various types of jet fuel are derived. These fuels come from the wide kerosene area in the middle of the distillation tower and tend, in some instances, to include lightweight hydrocarbons from gasolines, either from an overlap in their distillation process or through deliberate blending. It is blending of hydrocarbons over a given condensation area that determines the "cut" of fuel. Notice in figure 2, the range over which JP-4, a wide cut fuel, has been collected as compared to the collection range of JP-5, a narrow cut fuel.

e 2. Wide Cut/Narrow Cut Approximations



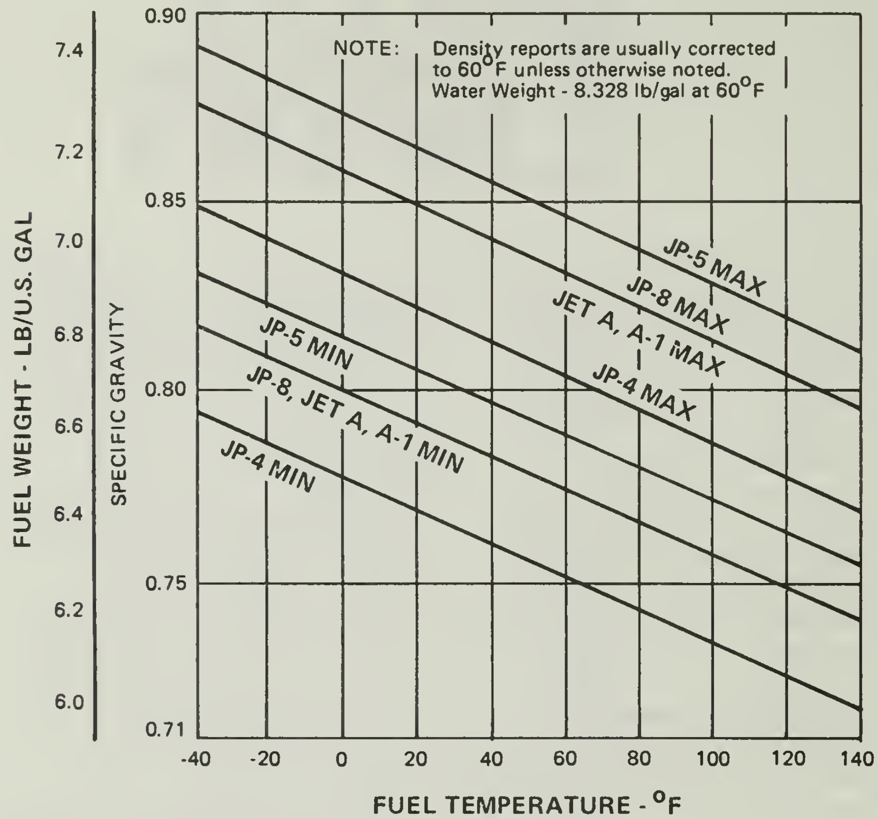


Figure 3. Jet Fuel Density Variations

As the first jet engines were developed in the 1930s, kerosene was the normal fuel requirement. Development and refinement of engines caused a need for special fuels for military uses. Meeting those special needs gave us our first jet-designated fuel, JP-1; the initials "JP" relate to jet propellant.

This new fuel was carefully refined strictly to satisfy the technical needs of newly designed engines, but little or no thought was given to the availability or cost structure of this fuel. Consequently, the military found it had specified a fuel that could not be produced economically. A new formula, JP-2, was initiated in 1945 and during its use it was found to lack certain viscosity requirements. An improved fuel was then devised in 1947; it was called JP-3 and, to a great degree, it made up for most of the problems posed by earlier fuels. But it too had a negative side that proved to be prohibitive. During a rapid climb to altitude in a high performance aircraft, it would boil off 25 percent of its own volume, severely restricting the aircraft's range. In 1951, the solution to that vaporization problem of JP-3 was solved by the introduction of JP-4, a fuel still used today by the United States Air Force.

As engine refinement advanced, more specialized fuels were needed; many new aircraft and engine designs introduced requirements which had to be met by speciality and new general purpose fuels. Meeting those needs were fuels such as JP-5, JP-6 and JP-7. Most common in use today is JP-5, which was formulated for use in hazardous areas where a high flash point was required, as aboard aircraft carriers. JP-6 was a specialty fuel specifically developed for the XB-70, an experimental bomber, while JP-7 was developed for use in the SR-71A.

Recently, JP-8 was introduced into the market; its properties similar to jet A-1 (the internat commercial jet fuel), with add that control icing and corrosic

While the Air Force is atter to establish a world wide standardization of JP-8 fuel, commercial aviation uses seer taking a different path. Comm jet engine fuel specifications in the United States by the Ar Society for Testing and Mater (ASTM). Current fuels are ide with letter designators: Jet-A, A-1, and Jet-B. Jet-A and Jet are practically the same excep has a maximum allowable fre point of −40°C, while jet A-1 freeze point is −50°C. Jet-B i wider cut of fuel with separat specifications. An increase to maximum of −47°C is being considered for Jet A-1 which increase its availability by abo percent.

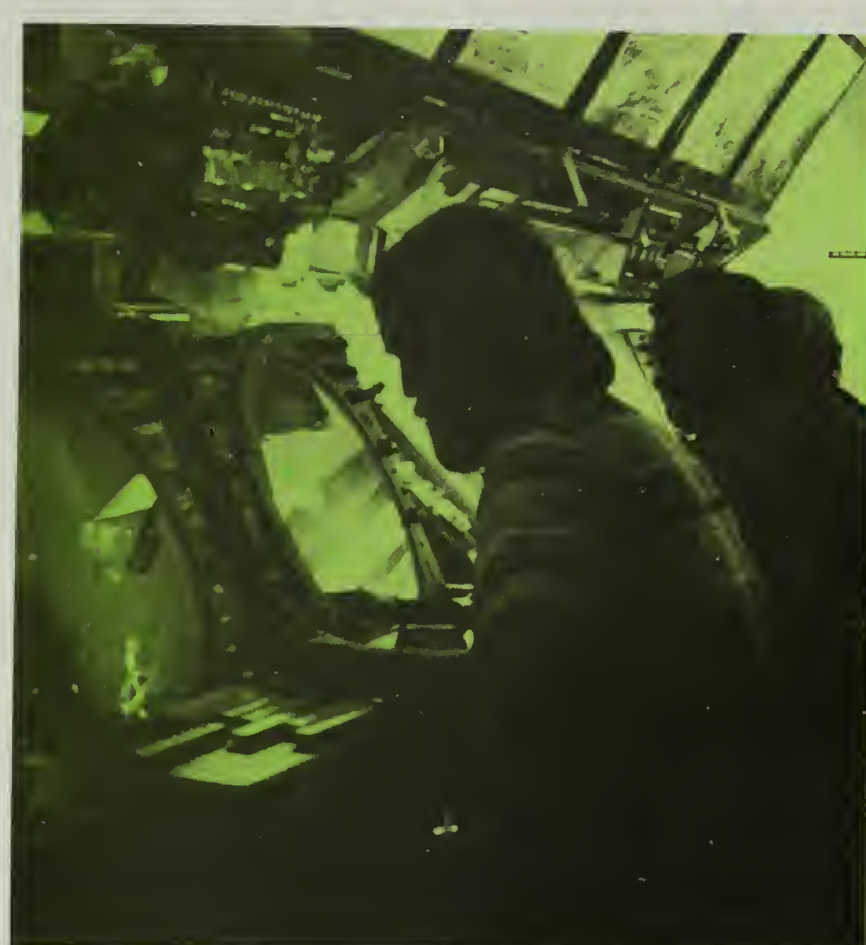
Other parts of the world use different designations to defin fuels. Canada has a "GP" ser while the United Kingdom use "DERD" series. Many fuels undergoing changes to meet th demand of an intensive energy business, indicating that the commercial fuel picture is not approaching anything universa

Figure 3 shows how fuel we varies with temperature. The specification density values ar written assuming a standard temperature of 60°F. The JP-8 specification allows a density approximately 6.5 to 7.0 poun gallon. Fuel density is inverse proportional to temperature: as temperature increases its densi decreases; if the temperature decreases, density increases al the characteristic curve. Frequ reports are received quoting a pounds-per-gallon" fuel, but specification does not allow fo

continued on page 26

Pilot/ Controller Confusion

e following mixup involved a ot of one of our sister services, t it happens to our guys too. In me instances the results were al.



As the pilot of 12345 reached oint 16 miles from destination, was cleared to descend from 000 to 9,000 feet. At that time requested a PAR approach. ile passing 11,000 feet further scent clearance was requested. er being asked to IDENT, he s then cleared to 3,500. This arance was read back to Ap- ach Control.

t 5 miles south of the airfield, 45 was instructed to turn right 50 degrees, to maintain 3,500 , and to contact Approach. The t read back these instructions shortly thereafter reported sing 7,500 for 3,500. For the e turn, 12345 was instructed urn right to 270 and maintain 00. On readback the pilot said 0 and 2,500 for 345?" with a nite interrogation reflection. approach controller responded 5 affirm, pilot's discretion per- landing cockpit check." Pilot responded, "345."

At this point control of 12345 was transferred to the PAR final controller. Approximately 1 minute later 12345 reported "345 is making a right turn inbound." The final controller responded, "345 roger, say your altitude." The pilot reported level at 2,500 and was immediately told to climb and maintain 3,500 and to turn right to heading 360.

In retrospect, the pilot stated that he had challenged the 2,500 foot assignment. What had happened, however, was that the pilot had mistakenly cleared himself to 2,500 vice 3,500. Unfortunately, the approach controller did not detect the pilot's confusion on the base leg readback. To further complicate the situation, it was at this point that control of 12345 was passed to the PAR controller. Subsequently, both the pilot and the PAR controller simultaneously recognized the error and corrective action was taken.

This breakdown in communication emphasizes the necessity of ensuring accuracy when transmitting back instructions received. As a result of this hazard report all controllers were reminded that communication encompasses not only formulation and transmission of information, but also includes interpretation and understanding as well. In cases where doubt or ambiguity exists, controllers have been directed to take positive action to clarify/verify intent.

A final point: It's not the controller whose bod is on the line. It's Joe Pilot and his PAX. So in self defense, let's listen a little better, enunciate better and *know absolutely* that you and the controller have a perfect mutual understanding. ■

LOOK TO SEE

When meteorological conditions permit, "regardless of type of flight plan, whether or not under control of a radar facility, the pilot is responsible to see and avoid other traffic, terrain and obstacles." AIM (traffic advisories)

■ The B-727 – Cessna 172 midair at San Diego last September heated up the controversy over how best to prevent midair collisions. The FAA has proposed extensive new traffic separation proposals that have been contested by other interested parties such as the Airline Pilots Assn (ALPA), Aircraft Owners and Operators Assn (AOPA), General Aviation Manufacturers Assn (GAMA) and others. Each has a vested interest in how the airspace is to be controlled.

All parties have, no doubt, valid reasons for the approach they take, but whatever the outcome, one thing is certain: midair collision prevention is a subject of utmost interest to all pilots.

Lest we forget, however, whether control is exercised from the ground or by airborne devices, along with various airspace restrictions and rules, *see and avoid* will be with us for a long, long time.

The trouble with see and avoid is that pilots do not always see aircraft that are a potential threat. Seeing means developing the technique of the fighter pilot, who knows that seeing a potential enemy first is his best life insurance. But there is more to seeing than just taking an occasional peek through the windscreen. Over the years we have learned some techniques for *seeing* rather than just *looking*.

An airplane at long range is seen as a mere dot; without relative motion it may not be seen at all. But to see the motion, the eye's gaze must be fixed. Therefore, the idea that the head and eyes must be constantly moving is erroneous. The best technique is to scan the sky in small segments, fixing the gaze, then moving to the next segment.

Unless there is something more distant to focus on, the eye will focus just outside the airplane – three to perhaps six feet away. If you see another airplane at that range, forget it! But you can see at a much greater distance by focusing on a cloud, an object on the ground or a mountain several miles away. Then search a sector, refocus and move to another sector.

There are a number of other aids to seeing. If you wear glasses, be sure they're clean. Ditto visors. Ditto, ditto windscreen. Also, you should know that haze may prevent you from seeing another aircraft until it is very near.

Hang loose. By that we mea[n] move your head and body so y[ou] won't be the victim of a canop[y] or other structure. Several year[s] a fighter and a helicopter collid[ed at] pattern altitude for the fighter. [The] two aircraft were flying on a converging course and the fight[er] pilot, who survived to testify, s[aid] he never saw the chopper. Reconstruction by the accident investigation board showed that [the] helicopter's motion relative to t[he] fighter was zero, and that it wa[s] hidden behind the fighter's can[opy] bow the entire time.

Which brings us to an axiom: [if] the other guy is moving relative [to] you, a collision is not likely to occur." On the contrary, if an aircraft is seen as having no rel[ative] motion – look out! You're abou[t to] become a statistic.

Now, having seen, one must [act.] Figure 1 will help illustrate acti[on] to take depending upon relative position. First off, you want to [keep] the bloke in sight until the dang[er is] past. In "D" Figure 1, a turn i[n the] direction of movement would m[ean] that you would lose control. In [a] near collision situation you wou[ld] know when to turn back. Best

Figure 1

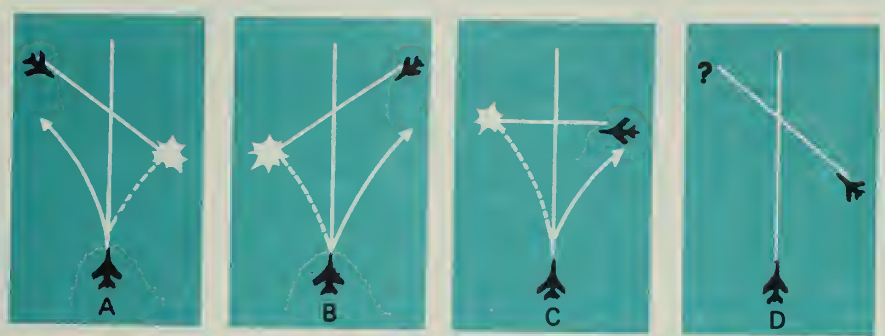


Figure 2 Each person has a blind spot, normally about 30° right of center, looking straight ahead. To find your blind spot hold this page at arms length with both eyes open, focusing on the cross at left. Bring the page in until it almost touches your face. With both eyes open you should not lose sight of the airplane (right). Close your left eye and try again, right eye focused on cross. The airplane should disappear and reappear as you draw the page closer.

n– if he is descending, climb. hen both aircraft are pointed at other– headon– and in level , turn down and right to keep n sight. If the above conditions but you don't know his de, look for clues like belly or wing showing. If you see the f the aircraft, fly up and right. may lose sight of him, but you e increasing separation.

and Avoid is so important se uncontrolled aircraft ently are not seen on radar. Up in positive controlled airspace craft are relatively safe. Not so er types of controlled airspace s the traffic pattern. (A NASA showed that from July 1976 to nber 1978, 65 percent of the nisses reported occurred in) It's up to each crew to look d keep track of other aircraft. is invaluable but not if it t see a light plane on a on course with you, for e.

e you've acquired vision of r aircraft, you must keep track and assume he doesn't see he wisdom of this is cored by a finding in the San collision by the NTSB. The nding, announced as this is vritten, was that the crew of 727 lost track of the Cessna,

Figure 3

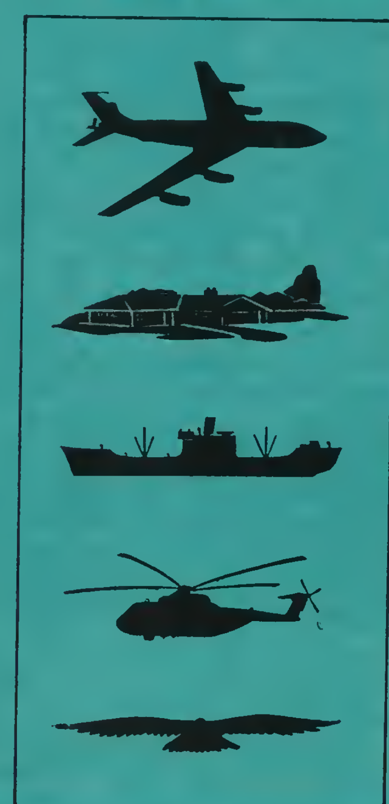
TEST YOURSELF

COVER THE BOXES AT RIGHT WITH YOUR HAND AND READ THE INSTRUCTIONS BELOW

What do you see? Below are silhouettes of various objects, including aircraft. Concentrate your gaze on the spot labeled "Focus Here." Which of the aircraft represent a threat? Which is the biggest? Are they coming or going? Identify the various objects.

This test should give you some idea of how good (poor) your peripheral vision is. Remember that your eye will be focused at the same distance as these examples and there is good contrast. Compare this to the varying conditions in flight and draw your own conclusions as to your visual limitations.

• FOCUS HERE



LOOK TO SEE continued

the most probable cause.

Controllers are sometimes bad-mouthed by pilots, but most of us respect their ability and their responsibility. They have prevented countless midairs. But sometimes there is a glitch in the system; Murphy works here, too. Therefore, the prudent pilot, while appreciating anything the controller does for him, accepts responsibility for his own aircraft.

Flying has little room for assumptions. If you lose sight of other traffic you can't assume he will maintain his present course or that he has seen you. Frequently he hasn't. Daily, the message traffic contains HATRs and NMACs wherein the Air Force pilot either sees or is advised of traffic and takes evasive action without the other guy taking any action. These are usually light airplanes not on a flight plan and not in touch with any controlling agency. Much of the time they don't appear on radar. However, if radar sees one, reports to you and you lose the target, don't be afraid to ask where he went. Your friendly controller will oblige.

Some fine advice is contained in the AIM. In addition to the quotation which began this article, the following points can help you have a good day.

Pilot:

- Acknowledge receipt of traffic advisories.
- Inform controller if traffic in sight.
- *Advise ATC if a vector to avoid traffic is desired.*
- Do not expect to receive radar advisories on all traffic. Some aircraft may not appear on the radar display. Be aware that the controller may be occupied with higher priority duties and unable to issue traffic for a variety of reasons.
- Advise controller if service is not desired.

Controller:

- Issues radar traffic to the maximum extent consistent with higher priority duties except in positive controlled airspace.
- *Provides vectors* to assist aircraft to avoid observed traffic *when requested by the pilot.*
- Issues traffic information to aircraft in the airport traffic area for sequencing purposes.

See and Avoid: Pilot— when meteorological conditions permit, regardless of type of flight plan, whether or not under control of a radar facility, *the pilot is responsible to see and avoid other traffic,* terrain and obstacles.

If a controller calls traffic that sounds too close, depending on conditions, ask for a vector— or if enough information is given start a turn to increase separation and advise the controller. The above underlined points highlight the responsibility of both the pilot and the controller under the present rules. The necessity of being constantly alert for VFR traffic especially outside of positive control cannot be overemphasized. ■

OK IS NOT OK!

Why not? Okay for st
let's look at one likely m
of OK. Suppose we ha
aircraft tooling along a
highest altitude in our s
of airspace at a busy
and the pilot reque
change to a specific h
altitude (not in our se
Further suppose tha
reply is "OK, stand by."
suppose the pilot only
the "OK" and starts th
tude change. Things
become not-so-OK in a
Can't happen? It can,
shouldn't!

Okay, to add to the
lem, the controller ir
theoretical incident mis
OK to acknowledge re
of the pilot's request, r
approve it. But how i
pilot to know that? If
sharp, he'll request con
tion or otherwise realiz
specific clearance to "
and maintain" was n
ceived. But, he may
especially if he has be
accustomed to using
ceiving sloppy phrase
Similarly, when airc
acknowledge with "OK
difficult to know whethe
mean "roger," "affirma
"will comply," "that's
rect," or something else

According to most di
aries OK and Okay are
primarily to express a
ment or approval. OK n
"approved" not "stan
and not "Message rec
reply follows." But in
OK is not approved ph
ology, and it's not "Pr
sional"—OK is not O
ATC!—(FAA Air Traffic
ice) ■

THE PROFESSIONAL APPROACH

Air Force Communications Service
Scott AFB, IL

Almost in the beginning, life was simple and easy a pilot and a controller. There was one pilot per ne, one tower controller, one control frequency, l one sky. Everyone was happy and if the radio s working, the pilot knew everything that was ng on in the sky.

hen along came radar and another controller and the sky was divided. Another frequency was ied to keep the congestion down. Still everything s all right. A pilot still was aware of everyone in immediate area because they were all on a com- n frequency.

hen along came precision radar (PAR), and gs began to get complicated. The pilot on final roach wanted to have neither the tower con- er and the tower controlled aircraft, nor the radar troller with the radar controlled aircraft, on the uency while trying to fly an aircraft using instruc- s from a radar final controller. Now everyone was appy. The pilot demanded a discrete frequency final approach so other instructions would not rfere with instructions from the final controller.

nen along came more controllers, more pilots, e frequencies and less sky in which to fly. Pilots e changed from ground, to tower, to departure, pproach, to arrival, and finally to the final con- er frequencies. The pilot was now forced into a rienting maneuver of changing frequencies in weather, in close proximity to the ground during n. The pilot was now unhappy and annoyed with harrassment until someone came up with the of a complete approach on one single frequency. e the pilot normally flew a precision approach by radar, this frequency was more often than not a "single frequency approach (SFA)" on a discrete frequency. Now things looked brighter for the pilot. Pilots came to expect SFA and their habits were reinforced by air traffic controllers supplying a single frequency discrete approach.

Then along came the ILS which eventually replaced the PAR at most locations. The deletion of the PAR was accompanied by the deletion of discrete frequencies that were justified by it. The pilot started to worry again. The controller advertised "SFA" in the en route supplement but in most cases did not provide it for an ILS approach. This placed the pilot back in a hazardous situation of changing frequencies at a time when he should be smoothing off the rough edges of a final approach with two or three aircraft hanging on the wing.

What does your base advertise? If SFA is in the communications section of the en route supplement, are you complying with the advertisement? Does a letter of agreement (LOA) with an FAA facility state that the FAA will send the aircraft to your tower frequency at or prior to the final approach gate? If it does, you should not advertise SFA or you should change your LOA to let the FAA clear the aircraft to land after the FAA has accomplished coordination with your tower. Base operations, wing commanders, DOs, flying safety officers and air traffic control operations personnel should all review local and published procedures to ensure safe and expeditious flight and make sure ILS approaches are also handled as SFA. Air traffic control managers along with flying safety people should explain to the aviator in detail the differences between discrete approach frequencies (frequencies where one pilot only is on one frequency such as a PAR) and single frequency approaches (a service provided under a letter of agreement to military single piloted turbojet aircraft which permits use of a single UHF frequency during approach for landing). It should be noted that the FAA considers, in certain cases, a discrete frequency as one that is assigned to an area or sector for control use only in that sector. ■

FLYING FOSSILS continued from page 20

pounds-per-gallon fuel at 60°F. Therfore, if 6-pounds-per-gallon fuel were loaded, it would be on the low side of the specifications and loaded at 130°F or higher.

Fuel choice is often based on the elements; weather is an important factor in any operating plan. For example, an aircraft departing Honolulu with full tanks of JP-4, on a given day, would reach its destination with relative ease. But, some time later, the same aircraft, departing on the same route and facing adverse winds would require more pounds of the same JP-4 than was used on the first trip and more than the tanks would hold (the aircraft range would be "fuel volume limited" with JP-4), so a different fuel offering a greater density, Jet A or Jet A-1, would have to be used.

There is a move to increase the maximum allowable freeze points in order to increase the availability of aircraft turbine fuel. Availability can be increased by including a heavier hydrocarbon in the refining process which will raise the fuel's freeze point. The producers have traditionally targeted the freeze point to be several degrees below the user's requirement. This ensures compliance with specifications should something happen to cause a variance in the properties during the refining process.

As petroleum products become scarcer, the producers begin to crowd the margin between the maximum allowable freeze point and the desired freeze point of the fuel they produce. It is an advantage for them to take the lighter fractions (figure 2) that they would normally make into aviation fuel, and sell it in another market for production into still lighter combustibles not associated with jet fuels. Generally, margins on freeze points of jet fuels are decreasing.

Douglas recommendations relevant to maintaining indicated tank fuel temperature at some margin above freeze points of fuel were contained in a recent DC-10 All-Operators Letter which reads in part:

Some operators are prohibited by regulation, or company policy, from dispatching into areas where forecast air temperatures are below certain values related to fuel freeze points and margin recommendations. A fuel temperature indicating system improvement will allow these operators greater freedom in route selection and flight planning. Current Douglas recommended operation is to maintain a margin of 5°C between indicated tank fuel temperatures and the freeze point of the fuel being used. If indicated fuel temperature cannot be maintained above this level and the flight continues for 30 minutes or longer at flight altitude, the flight crew should consider measures to increase total air temperature and limit fuel cooling. Total air temperature may be increased by increasing Mach number or by altering the flight path into warmer air by course changes or altitude reduction.

The recommended margin is based on fuel temperature indicating system tolerances, fuel system configuration and operation, a[n]
fuel physical property
considerations. A reduction in
recommended fuel temperature
margin from 5°C to 3°C may b[e]
effected on DC-10s by installi[ng]
indication system components.

It should be remembered tha[t]
aircraft instrumentation doesn'[t]
differentiate as to type of fuel
but only indicates what is happ[ening]
with a particular fuel aboard.
Because of difficulty in determ[ining]
the actual freeze point of a fue[l]
batch as delivered to the aircra[ft]
resolving the actual freeze poi[nt]
tank of fuel which most likely
mixture of other batches, all w[ith]
varying freeze points, the airli[nes]
tend to look at the allowable
maximum freeze point for the
purchased.

Fuel will naturally absorb w[ater]
from the atmosphere when it is
stored in vented tanks; the amo[unt]
absorbed depends upon humidi[ty]
the temperature of the fuel. As
fuel temperature increases, its
solubility (the amount of water
fuel will absorb) increases, but
the temperature decreases the w[ater]
comes out of solution, precipit[ates]
and settles to the bottom of the
storage tank. When fuel is load[ed]
into the aircraft (at ground
temperatures) and flown for a p[eriod]
of time, the fuel temperature re[duces]
significantly and again the wate[r]
remaining in the fuel settles to
bottom of the tanks. Some wat[er]
will enter the sump areas where
could freeze if the temperature
lowers sufficiently. If this were
happen, the ice crystals suspend[ed]

ne fuel would be carried through feedlines and accumulate on the r. Eventually, the crystals would ass the filter and move on ard the fuel control. Most raft, however, are equipped with ous fuel heating methods to ent ice crystals from progressing far. The CF6 engine on the 10 uses a fuel/oil heat anger. It is located upstream of uel filter ensuring that any ing ice will be melted before it hes the control. The Pratt & tney engines on the DC-10 use a and heating method, which is ated either manually or matically.

viation turbine fuel has a tation for high quality; ported by ships, barges, or igh pipeline systems to the inal and then to an aircraft, it is ed and processed through water rators several times. At the eld, the fuel passes through a /separator one more time before pumped to the aircraft fuel s.

el tanks are never fully water- and sumps are provided to catch ture that drains to the tanks' r areas. This water can be drawn before operational ems develop, or before some obiotic contamination causes sion.

uglas transports are fitted with nuous scavenger systems either e factory or through retrofit. ystem does not replace manual sumping, but it does pick up which runs to the bottom of nk and helps to prevent water nulation. A fuel-driven pump picks up the water, mixes it with fuel, and places it near the inlet of the fuel tank pump. It is then fed to the engine in very small percentage mixtures, which the engine can handily accept.

Fuel additives tend to limit icing, electrostatic generation and excessive fuel pump wear. Corrosion inhibitors are usually added to fuel systems to prevent rust in the pipeline, which can cause a rouge (a powder similar to jeweler's rouge) contamination in the fuel. The rouge particulate is extremely small and difficult to filter out. While this type of contaminant will not likely cause a clogging problem, it can cause wear on moving parts.

To increase jet fuel availability, there are moves afoot in the industry to broaden specifications by broadening the range of acceptability for parameters that define fuel specification. As previously mentioned, maximum allowable freeze points are going to be adjusted upward. The aromatic contents of jet fuel made to the various specifications have different limiting values: 25 percent in military fuels and 20 percent in commercial specifications. The commercial specifications are being changed to allow an increase, first to 22 percent and then probably to 25 percent, to match military allowances. The smoke point will be reduced from the current maximum allowable of 20mm to 19, and eventually to 18mm with the control on maximum allowable percentage of naphthalenes. In some military specifications, these parameters which control the burning quality of the fuel may be replaced by hydrogen content. Another move is to allow the same hydrogen specifications in commercial jet fuel.

The minimum allowable flash point of commercial fuel is currently 100°F, a reduction from about 120°F. Because the availability of fuel would increase if more range were allowed on the lighter ends (except lower-boiling hydrocarbons), it is then suggested that the minimum allowable flash point for Jet A be lowered to approximately 90° or even 80°F.

The word "availability," which we have used several times, does not imply more available crude oil for the world; nor is there going to be more product from a barrel of crude. If we should broaden the fuel specification, we allow a wider cut on the distillation curve, giving us access to more hydrocarbons available from a barrel of crude. Also, we are becoming less choosy about other fuel qualities.

Safety is paramount of course, and should not be compromised; therefore, in the competition for hydrocarbons it may be necessary to live with shorter time between overhauls of expensive engine components. In the future, there may be restrictions on fuel from current petroleum sources. This could come about either through political decisions or through depletion of natural supplies. But the petroleum industry is constantly researching alternative sources for jet fuel. — Edited from *Douglas Service Magazine*, Jan/Feb 1979. ■

MAIL & MISCELLANEOUS

THE CARE AND FEEDING OF ATTACHED CREW MEMBERS

■ To the advice offered in Dave Froehlich's excellent article on "The Care and Feeding of Attached Crew Members," (*Aerospace Safety,* February 1979) I would add, for the unit and flier, coordinate the scheduling as far ahead as feasible and spread out the limited sorties on as even a basis as possible. Get as much training benefit from each flight as can safely be worked in. One regular mission each Wednesday goes a heckuva lot farther than four back to back with a four week dry spell (admittedly tough to do in many attached flying situations).

For the attachee, bend your schedule to make a planned mission. There are always a hundred less important but more pressing things to do than go fly.

For those involved in reduction of overhead and attached fliers to make more sorties available for primary duty aircrews, I suggest the surgical vice the meat axe approach. There are benefits for staff familiarity (recent) with pre-flights in the cold and rain, air traffic control saturation, last minute diverts and mission changes, etc.

Col A.S. Warinner, attachee,
formerly attachor
318 Air Div/DO
APO San Francisco 96301

BAILOUT

I have a small collection of aviation magazines from the early 60's that I was going through the other day. A couple of copies of *TAC Attack* from 1964 and 1965 caught my eye and I thought it might be interesting to see if "things" had changed.

Everyone in safety knows there are no new accidents. A review of the prangs of 15 years ago seems to confirm this. There are other things that catch the eye, though. In January 1965 TAC experienced twelve major non-combat accidents. There also seems to be more professional pride in flying as opposed to management in those articles. A lot of the thrust is directed toward a balance between aggressiveness and safety.

I did see something in those magazines that I haven't seen elsewhere in quite some time. The message was: "If you have a sick bird, get out. You aren't being paid to fly bad airplanes."

That made me wonder whether the lack of emphasis on that message might be a factor in the decreasing ejection survivability statistics. Naturally, there has been a lot of emphasis on the cost of hardware. At the bottom of each Well Done page is the statement ". . . saved a valuable combat aircraft." In '64 and '65 those pages ended with: ". . . was able to bring his aircraft to a safe landing so investigators were more able to find the cause of the malfunction," or, ". . . presence of mind and proficiency under extremely adverse conditions qualify him as Pilot of Distinction." Again I wonder if we don't, just a bit, make the aircrew too aware of the cost of their airplane and its place in the maintenance of the peace and security of the free world. I don't rem[...] the last time I saw the one abo[...] ways being able to build mor[...] planes.

I know of two incidents whe[...] crew might have bailed out but c[...] In the first, a B-52 descended [...] the glide slope and struck some [...] in an almond grove. The airplan[...] tinued through the trees for a bit [...] the pilot brought it out. The EW[...] me (that) as the sound of the [...] breaking started he looked a[...] gunner, both blew their hatches [...] waited for the other to bail out. [...] were lucky. The second Buf lost [...] engines on takeoff, mushed alo[...] a while and crashed about a mile [...] the end of the runway. Five were [...]

I don't know why those p[...] didn't depart the airplane. I don't [...] that the fact the airplane didn't [...] is justification for staying with it [...] of the envelope ejection is the le[...] killer of those who didn't make it [...] fortunately, by the time it bec[...] obvious the airplane isn't goi[...] make it, the seat probably [...] either.

It is fine to make up your mi[...] eject in a specific situation; i[...] it is necessary. The problem li[...] those situations that don't quite [...] your ejection criteria. I submi[...] at those times when you are [...] barded by all the factors in the [...] gency, there may be a subcons[...] desire to save one for the Gippe[...]

At the risk of offending the [...] per, I don't think he would min[...] saving one for yourself. ■

Capt Bruce E. Slasienski
453 FTS
Mather AFB, CA 95655

☆U.S. Government Printing Office: 1979—68

STATES AIR FORCE

Well Done Award

esented for
nding airmanship
professional
rmance during
ardous situation
nd for a
ant contribution
to the
States Air Force
dent Prevention
Program.

CAPTAIN
Joseph J. Mastascusa

CAPTAIN
Wendell Johnson

429th Tactical Fighter Squadron

Nellis Air Force Base, Nevada

■ On 28 June 1978, Captains Mastascusa and Johnson, flying an F-4D, were returning from a low level navigation/air-to-ground training mission. Immediately after touchdown, the right wing dropped and the aircraft entered a severe, uncontrollable drift toward the right edge of the runway. Captain Mastascusa applied full left rudder and aileron while simultaneously adding full afterburner thrust for go-around. These corrective actions arrested the aircraft's drift toward the GCA facility, although the aircraft departed the runway surface and continued on the hard packed sand infield for approximately 1000′ before becoming airborne. A chase aircraft informed the crew that the right main wheel was missing, as well as the aft section of the right external fuel tank. Quickly analyzing their alternatives (fuel supply was critically low), the crew elected to execute a gear-up, cable arrested landing. They retracted the gear, jettisoned their centerline SUU-23 gun pod in the published jettison area, and reviewed gear-up landing procedures with the SOF. Meanwhile, the base fire department foamed the first three thousand feet of the runway. With only a thousand pounds of fuel remaining, the crew performed a controllability check while maneuvering for a straignt-in approach. When Captain Mastascusa lowered the flaps the aircraft rolled violently. He immediately raised the flaps and Captain Johnson computed a no-flap final approach speed. The crew performed a perfect gear-up, no-flap, cable arrestment. The only damage incurred was to the two external wing tanks. Post flight inspection revealed that the right main gear strut cylinder fork had failed at touchdown. The wheel and tire assembly then impacted the right trailing edge flap with sufficient force to break the flap actuating rod. This crew's instant reaction to a critical emergency and their subsequent superior airmanship, crew coordination and sound judgment saved a valuable aircraft and averted possible injury or loss of life. WELL DONE!

1978 USAF Safety Plaques

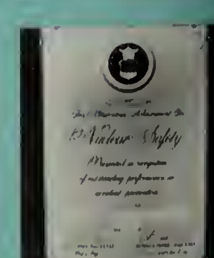
The safety plaques are awarded to units below MAJCOM level, except f the Flight Safety Plaque for units below Air Divis level. Award is based o outstanding safety achievement.

EXPLOSIVES SAFETY
AAC
5010th Consolidated Aircraft Maintenance Squadron
AFSC
Air Force Weapons Laboratory
Armament Development and Test Center
ATC
3290 Technical Training Group
NGB
107th Fighter Interceptor Group
PACAF
51st Composite Wing (Tactical)
SAC
1st Strategic Aerospace Division
TAC
1st Special Operations Wing
33d Tactical Fighter Wing
366th Tactical Fighter Wing
USAFE
26th Tactical Reconnaissance Wing
48th Tactical Fighter Wing
52d Tactical Fighter Wing
81st Tactical Fighter Wing
86th Tactical Fighter Wing

FLIGHT SAFETY
AAC
5010th Combat Support Group
AFCS
1866th Facility Checking Squadron
ATC
14th Flying Training Wing
557th Flying Training Squadron
Officer Training School
AFSC
3246th Test Wing
ADCOM
17th Defense Systems Evaluation Squadron
57th Fighter Interceptor Squadron
87th Fighter Interceptor Squadron
AFRES
302d Tactical Airlift Wing
403d Rescue and Weather Reconnaissance Wing
508th Tactical Fighter Group
911th Tactical Airlift Group
MAC
33d Aerospace Rescue and Recovery Squadron
39th Aerospace Rescue and Recovery Wing
53d Weather Reconnaisance Squadron
62d Military Airlift Wing
63d Military Airlift Wing
76th Military Airlift Wing
374th Tactical Airlift Wing
375th Aeromedical Airlift Wing
436th Military Airlift Wing
437th Military Airlift Wing
463d Tactical Airlift Wing
NGB
102d Fighter Interceptor Wing
107th Fighter Interceptor Group
165th Tactical Reconnaissance Squadron
174th Tactical Fighter Group
184th Tactical Fighter Training Group
189th Air Refueling Group
192d Tactical Fighter Group
PACAF
8th Tactical Fighter Wing
15th Air Base Wing
475th Air Base Wing
SAC
6th Strategic Wing
42d Bombardment Wing
43d Strategic Wing
380th Bombardment Wing
416th Bombardment Wing
TAC
1st Special Operations Wing
24th Composite Wing
27th Tactical Fighter Wing
347th Tactical Fighter Wing
366th Tactical Fighter Wing
507th Tactical Air Control Wing
552d Airborne Warning and Control Wing
USAFE
20th Tactical Fighter Wing
50th Tactical Fighter Wing
86th Tactical Fighter Wing
401st Tactical Fighter Wing

MISSILE SAFETY
AAC
343d Equipment Maintenance Squadron
5010th Consolidated Aircraft Maintenance Squadron
ADCOM
Air Defense Weapons Center
5th Fighter Interceptor Squadron
10th Aerospace Defense Squadron
57th Fighter Interceptor Squadron
318th Fighter Interceptor Squadron
4751st Air Defense Squadron
4756th Air Defense Squadron
AFSC
Armament Development and Test Center
Space and Missile Test Center
Det 1, Space and Missile Test Center
NGB
107th Fighter Interceptor Group
PACAF
8th Tactical Fighter Wing
51st Composite Wing (Tactical)
SAC
42d Bombardment Wing
416th Bombardment Wing
44th Strategic Missile Wing
90th Strategic Missile Wing
321st Strategic Missile Wing
TAC
33d Tactical Fighter Wing

NUCLEAR SAFETY
ADCOM
Det 3, 425th Munitions Support Squadron
AFLC
3097th Aviation Depot Squadron
MAC
6th Military Airlift Squadron
NGB
107th Fighter Interceptor Group
SAC
42d Bombardment Wing
43d Strategic Wing
319th Bombardment Wi
341st Strategic Missile
4235th Strategic Trainin Squadron
USAFE
20th Tactical Fighter Wi



AEROSPACE

FETY • MAGAZINE FOR AIRCREWS JULY 1979

The Director of Aerospace Safety Special Achievement Award 1978

IS PRESENTED TO

LIEUTENANT COLONEL

Ernest R. Perkins

■ Lieutenant Colonel Ernest R. Perkins has distinguished himself as Chief of Safety, 366th Tactical Fighter Wing, in the development of an outstanding safety program. Lieutenant Colonel Perkins' reorientation of the wing safety office to concentrate on systemic-caused or supported mishaps reduced the incidence of these controllable events throughout the year. His personal investigations, innovations and suggestions brought significant safety improvements to the F-111 weapons system and to safety reporting and dissemination procedures. The wing converted from the F-111F to the F-111A, and from a centralized maintenance concept to the Production Oriented Maintenance Organization (POMO). In addition, there were numerous exercises and deployments overseas. Nevertheless, the wing had no Class A flight mishaps, no fatalities and no explosives mishaps. The Director of Aerospace Safety Special Achievement Award is presented each year to one individual or one organization for outstanding safety contributions or achievements. Lieutenant Colonel Perkins is the first recipient. ■

TED STATES AIR FORCE

AEROSPACE

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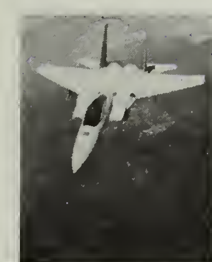

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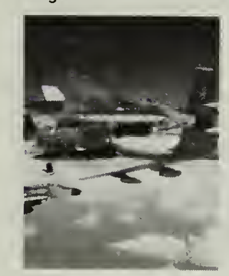

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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Then & NOW

ANCHARD F. ZELLER, PhD
Directorate of Aerospace Safety

■ It was 1943. The buildup for World War II was in full swing. The losses were enormous. That year the Air Force lost over 5,000 aircraft totally destroyed in over 20,000 major accidents. Needless to say, there was much concern.

The time is 1979. Last year there were 90 aircraft destroyed in 98 major accidents (currently called Class A's). Now, in the middle of 1979, there is also great concern. Why, with this spectacular improvement, is there concern? The reason is quite easy to explain: The long downward trend from 1943 until the early seventies has reversed. There is every possibility, even probability, that the 1979 record will represent an increase in losses which the Air Force can ill afford. While the numbers are much smaller than those in earlier years, the dollar costs are much, much higher, and the relative portion of the total force that one trained crew and airframe represent is greater.

To fix almost anything, it is first necessary to determine what the problem is. In-depth analysis of recent accident experience shows, as would be expected, that some are due to materiel failure, a few are due to various forms of inadequate support, but that the predominant factor is human failure.

Failures come in many forms, but two of the descriptive terms which appear most frequently in the current analyses are "lack of situational awareness" and "inadequate event proficiency." There are others too, such as "pressing" and "overcommitment," which imply that the individual has exceeded his capabilities in the context in which the loss occurs. These terms are not new, but the frequency with which they are appearing in board deliberations or in higher command review strongly suggests that something's changed. It is apparent that many things have changed: Aircraft are capable of higher performance, mission requirements are in a constant state of flux, support efforts are modified with time, and certainly all of these have an impact.

One other subtle change which is not as readily noted is that the average pilot of today is different from his average predecessor of a few years ago. This difference is not of his making but is a result of a system which requires higher performance at a lower level of experience, with less current practice to hone the skills required of the combat-ready crewman. One might suggest that this isn't really very important and that with increased effort (pressing) this deficiency may well be compensated for. While motivation is certainly important in performance, it must be on top of skill to be a truly effective factor.

As far back as the middle of the last century, it was observed that learning to do anything follows a constant pattern. Initially, the effort is associated with a high number of errors. With time, the number of erro decreases, and finally a state near perfection is developed. constant relationship of error time is so universal that the t "learning curve" was applied this pattern. It is readily appa from examining this curve tha the average of experience is greater, the probability of erro less than if the average experience is less, in which c the probability of errors is gre

If one looks at average pilo experience today, whether in terms of total hours, hours in equipment, or experience as measured by events, it is apparent that, on the average the rated force the experience lower. Those of you in the ac inventory are well aware that line flying days are numbered that, unless there are major changes, you will shortly be a part of the rated supplement. When this happens, a newer less experienced individual wi take your place, so that the average of the entire force ma become even further reduced

This same basic learning cu applies to another factor of experience, and that is *curren* flying. There have been a num of studies which support the theoretical expectation which says that if you get more curre flying, your accident rate goes down. By implication then, les current flying means that the accident rate is probably going up. It is going up because with less current flying, the expectation of error is higher

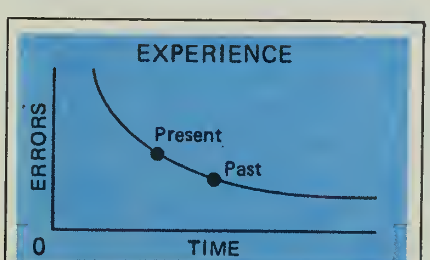
learning curve. If it can be cipated that with lower rage experience there is an ease in the probability of error with lower current flying there n increase in the probability of r, it stands to reason that if decrease, the probability is tive in some way. The current eased accident experience ıld not come as a surprise n these cold and objective stical measures of ability are ied. If, in conjunction with the eased propensity for error, the ands on the individual are eased, the probabilities of ng a mistake become even ter.

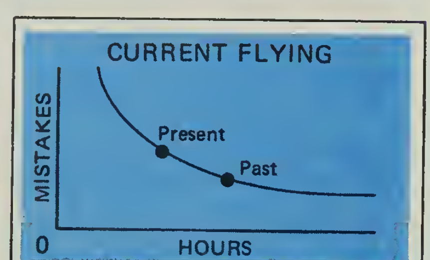
rtainly the situation of eased demand and decreased oetence will highlight iences in such things as ific event proficiency or ral situational awareness, as our accidents document. e question which will come ediately to the mind of those are involved on a personal is, "What can I do about " The answers are not as as the question, but there ome. There are training aids, ators, for example, which not be much fun to fly, but do serve a purpose. This ose is particularly well served rogram is well considered leveloped to achieve a fic objective in terms of proficiencies which directly to the flying to be nplished. Another approach accept that every hour of is indeed an hour of training and that the maximum number of events be practiced per unit of time. There are some other things the individual crewman can't do. These involve decisions regarding the rate at which certain requirements are imposed and, perhaps, modification of the requirements themselves.

Unfortunately, things may get worse before they get better. Knowledge, however, is power. With a clear understanding of some of the things that are happening, effective change becomes more probable. ■

World War II, 1943. The Air Force lost more than 5,000 aircraft destroyed in more than 20,000 major accidents.

Now the numbers are much smaller but the dollar costs are much higher.





4 BLUE NEWSLETTER

No Way Out

ROGER G. CREWSE
Directorate of Aerospace Safety

■ In the past 18 months we have had seven weather-related mishaps in which an aircraft was destroyed. In all of these, fatalities occurred. The basic problem which set up each of these seven mishaps concerned weather — unexpected, unforecasted, for the most part — which existed on a VFR route that made VFR flight not possible. These mishaps all have one thing in common. In the attempt to complete the mission as scheduled and as briefed, the pilot pressed on until he painted himself into a corner. VFR flight was no longer possible and there was no VFR way out of the situation in which he found himself.

The flight lead started a descent in an open area and as he proceeded, the bottoms of the clouds were found to be much lower than he thought.

In two of these mishaps, both involving fighters, other pilots on the same mission, flying the same route, had also experienced the same conditions. They aborted the mission because of weather, but failed to tell the people who were following that they had done so. The system which was controlling the mission also failed to pass the word that the weather made the mission, as briefed, impossible to complete. The mishap pilots then, as far as they knew, were flying a mission which had been successfully completed by those who had gone immediately before them.

In one of the mishaps, a helicopter crew attempted a cross-country flight VFR, with a marginal weather forecast. Shortly after takeoff they found that VFR flight was not possible and advised that they were returning to their departure base. The approach controller, in an effort to be helpful, indicated to the crew that it might be possible to maintain VFR conditions following a slightly different route. The helicopter crew attempted to fly the alternate route, ended up between layers, trapped in an IFR situation, and crashed attempting to climb out of it.

Two fighters in formation on a VFR mission, found when they arrived at their low-level entry area that the weather was considerably worse than forecast and that unless they could descend through a hole, the mission would be impossible to complete. The flight lead started a descent in an open area. As h proceeded, the bottoms of the were found to be much lower he thought. While trying to m VFR in the hole, he hit a hill in a cloud. Both aircraft were

One reconnaissance aircraft

. . . the pilot has not y been born who will not trapped by weather at point during his flying career.

night, let down into what was supposed to be VMC, was ob on radar maneuvering left and while descending, and struck ground. VMC conditions did exist.

A transport crew was attem recovery at a nonstandard airf snow showers. They were not

minimums, but continued the
roach from which a go-around
not possible, once committed,
ause of terrain. Control was lost
undetermined reasons and all
e killed on short final.

here is no question about the
lings of the various accident
rds that sifted through the
ckages.

he pilots of all aircraft failed to
ntain VFR flight, pressed on
l they were trapped in IFR
ditions. Most attempted to
age the whole mess without
body knowing they were
ating anything.

ommand and control elements in
eral of these mishaps, as well as
r own buddies, failed to advise
n that the weather was such that
flight could not be continued as
eduled.

nother point, and not quite as
rly defined by the accident
rds, is the fact that when they
arrived in that corner where
er VFR flight was inpossible,
action they took in attempting to
d any kind of a violation was
action which guaranteed disaster.
ts will continue to find
selves in situations where
pected weather is encountered.
ther forecasting is not an exact
nce and our method of passing
word still has serious gaps. A
pilots this year will find
selves, for whatever reason,
sing on in an attempt to salvage
mission and trap themselves. In
the pilot has not yet been born
will not be trapped by weather
me point during his flying career. This is not sufficient justification to die.

A helicopter has all sorts of advantages over the rest of us. He can stop, call for help, and get directions out of his particular mess. Even so, success is not guaranteed.

At 480 knots and 500 feet the problems become just a little different. Altitude is what's required. There is only one way to get it and that's pulling smoothly aft on the stick and doing it now!

Those who have crashed were trying to do a one-eighty at 500 or 600 feet above the ground in weather, or attempting to stay in a hole while they did their one-eighty and didn't, or pressed on, blindly hoping to luck out on the other side and didn't.

Pressing beyond minimums on final is always chancey if you have a choice. If destination fixation is the driver, she is a demanding mistress and extremely fickle.

The avoidance of these kinds of mishaps is so obvious that it hardly needs to be said, but we will:

When the mission parameters cannot be followed because of weather, you have but one option and that is to abort the mission for weather. ■

FARMS for sale

R.C. DELGADO
Directorate of Aerospace Safety

■ An apt subtitle for this article could be, "If You Don't Eject Above 10,000 Feet When You Are Out of Control, You Are Liable to Buy the Farm." The reason for this is that so many pilots, when they depart an aircraft from controlled flight, lose their lives trying to recover it.

The laws of physics have already decreed that this aircraft is going to have a violent collision with this planet.

All ejection-seat-equipped aircraft flight manuals have a warning about ejecting 10,000 feet (15,000 for some aircraft) above the ground when out of control. These figures take into account the recovery characteristics of the aircraft and the safe escape envelope of the ejection system. This warning, though, is too often ignored.

Pilots sometimes stay with a departed aircraft until it's too late. If they were more aware of their aircraft's recovery envelope, they might pay more heed to this warning and not stay with it until they reach the no-recovery point. At that point, the aircraft is destined to be fragmented into hundreds of small pieces. Even if the pilot stays with it, "attempting to overcome the problem," nothing he does is going to change the outcome. The laws of physics have already decreed that this aircraft is going to have a violent collision with this planet. If the pilot, for whatever reason, be it ego, stigma, lack of situational awareness, machismo, etc., continues to attempt to regain control even beyond the limits of his escape system, he, like his aircraft, is also going to be fragmented into hundreds of pieces. One of two things, both bad, are going to occur. He will become another number in the "out-of-envelope ejection fatality" column of mishap statistics, or he will be listed in the "did not eject— fatal" column. The results are the same. The Air Force has lost another asset and some family has lost a son, a husband, or a father.

The aircraft recovery envelope and the escape system envelope are not easily definable. Neither one is marked by a clear red boundary. This is why the 10,000/15,000 feet out-of-control ejection minimums are so important. These are not marked by red lines either, but there is at least an altimeter. Since it reads altitude above mean sea level and not above the ground, it behooves pilots to know the terrain altitude over which they are flying.

This era of realistic combat training involves a lot of low level flying. This makes the foregoing

agraphs even more relevant. You ght ask, "What if I'm already ow 10,000/15,000 feet above the und when I lose control?" A ple extension of the same logic have been discussing would gest you then eject as soon as recognize you are in a arture. Nobody should fault you this.

he following is a quote from a nt aircraft mishap report: "The g rocking is characteristic of an roach stall, suggesting the pilot attempting to recover the raft from the dive. Therefore, pilot did not perform boldface edures and attempted to recover ut-of-control aircraft below 00 feet. Analysis of the ejection em indicates the mishap pilot ated ejection approximately .6 nds prior to impact." There an escape system in the world can save a pilot under those litions. In the findings of such a

ow 10,000 feet, if ontrolled flight is ered, don't hesitate; ct!

ap there is usually one that "The pilot departed the aft from controlled flight for an termined reason. (Cause)" e is usually another finding h says, "The pilot delayed on until outside the safe ejection envelope. (Cause)" This happens far too often.

Table I shows the results of the 20 pilot-induced loss-of-control aircraft mishaps in the USAF in 1978. Of the 26 crewmen involved, only 10 survived. Six were ejection fatalities and 10 died because they did not eject. Four of the six ejection fatalities were due to out-of-envelope ejections. Fourteen of the crewmen involved died because of late ejection or no ejection attempt. Table II shows the engine failure mishap results for comparison purposes. Note that in these mishaps 18 of the 24 crewmen involved survived.

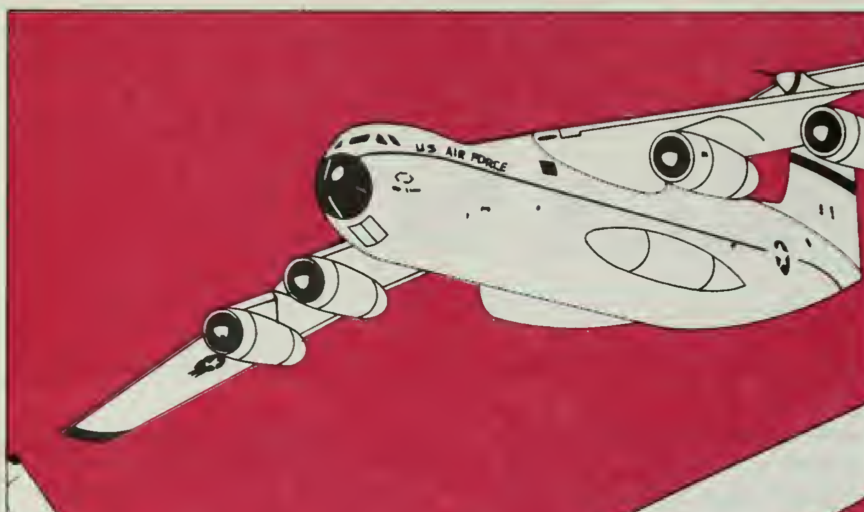
The message is quite clear. In the words of an aircraft flight manual: "If the aircraft is descending out of control, eject at an altitude not lower than 10,000 feet above the terrain. Below 10,000 feet, if uncontrolled flight is entered, don't hesitate; EJECT!" Heed this, and you may well get to put in your 20/30 years and retire. ■

TABLE I
PILOT–INDUCED LOSS–OF–CONTROL MISHAPS
1 JAN - 31 DEC 1978

Type Aircraft	NUMBER		EJECTED		DID NOT EJECT	
	Aircraft	Crewmen	Survived	Fatal	Survived	Fatal
Attack	4	4	2	1	0	1
Bomber	0	0	0	0	0	0
Fighter	13	18	7	4	0	7
Observation	1	1	1	0	0	0
Trainer	2	3	0	1	0	2
TOTALS	20	26	10	6	0	10

TABLE II
ENGINE FAILURE MISHAPS
1 JAN - 31 DEC 1978

Type Aircraft	NUMBER		EJECTED		DID NOT EJECT	
	Aircraft	Crewmen	Survived	Fatal	Survived	Fatal
Attack	3	3	3	0	0	0
Bomber	1	5	0	0	0	5
Fighter	9	12	10	0	2	0
Observation	1	1	0	1	0	0
Trainer	2	3	2	0	1	0
TOTALS	16	24	15	1	3	5



Close Encounters

■ A KC-135 reports a near miss of 350 feet from a Cessna 210.

A C-141 turning to intercept the localizer. Pilot increases turn rate to avoid a light aircraft by 200 to 250 feet.

A T-38 on final is advised by the final controller of traffic. The targets merged on both azimuth and elevation. Fortunately, the T-38 avoided a collision by approximately 200 feet.

A T-37 pulled up and rolled over the top of a light plane, missing by 200-300 feet.

Seems like the beginning of a late night horror movie. Well, it's not; it is the real thing. One base ha reported near misses in 90 Most of the reports read abou same as the others. ". . . light pilot took no evasive action. . Frequently, the other aircraft ha appeared on radar. Just as ofte other aircraft is never identified

From this it may seem that no can be done. Not so. At McC AFB where the KC almost co with the Cessna, the base spon an airmen meeting to which invitations were issued. Held i base theatre, the meeting gav base and the FAA an opportuni discuss safety with local fliers.

McGuire AFB is in a heavy t area because of its location i Eastern corridor between New City, Atlantic City and Philadel They are trying to get a TCA fo McGuire area with Stage III as an alternative. They have mitted an update to the IFR Su ment stressing the high near mis tential and published a NOTAM the subject. They, too, are me with general aviation pilots to the need for extreme vigilance caution.

Presumably, all aircrew mem respect the presence of another craft no matter what the classi tion. For those who don't, cons no matter how small, how slo how frail a light plane; no matter big, how fast and how strong you a collision can destroy both. ■

The TEN COMMANDMENTS For Aviation Survival

OR DAVID V. FROEHLICH
ctorate of Aerospace Safety

Heard it all before? Read on, use you may have heard it all re, but so had a lot of other d aviators and they are now ! Thus far this year we are still ing our bodies into each other the ground. Basically, the nine technology has improved, edures have been refined and of them combat tested, and ration equipment and rules have upgraded. Unfortunately, that es the ball squarely in the court e operator. For that reason (and use I recently lost another good d), let me pass on ten ways to ically increase the odds of you ining a survivor in the aviation ness.

HOU HALT . . .

1 Know thy machine – The lack of aircraft knowledge has done in some otherwise excellent ors. This knowledge extends basic systems operation (and gency operation) to machine tions (Gs and stuff). Not can systems ignorance cause sive panic during an emergency ion, but the operator may even n the problem. Knowing and standing your machinery can hen equipment life as well as own! Case in point – the pid aviator and crew were wending their way through the low-level route at night. They began to have fuel balance problems. The symptoms didn't match any of the exact dash one emergencies, so they began trying various fuel switch combinations. Engines began flaming out, it was soon very dark and quiet and the crew jumped out. They survived but the machine didn't. Monday morning quarterbacks like me say "if they had only known the system, they might have. . . ." Maybe, maybe not! Regardless, the knowledge of your equipment is essential to your *safe* and successful mission accomplishment.

2 Treat thy machine with respect — Definitely related to number one above, but an added necessity for survival. Once you know the systems and limits of your aircraft, you must operate that machine with respect. This proper treatment includes judgment and restraint. In other words, if the mission or maneuver calls for 480 knots, 4 Gs or a certain altitude – follow the parameters. If you only need to pull 4, pull 4, not 6! The main reason is equipment life and wear. Those of us who have flown the T-Bird "subsonics" were acutely aware of

the relationship of lengthy time-to-climb, full throttle, low airspeed and subsequent high EGT. This combination is hard on the internal machinery. The principle is the same for most engines and the more air you can keep coming in the front end, the less strain you are putting on those aging blades and buckets. It also goes without saying that respecting the machinery includes observing warm-up times and operating limitations. They are there for a purpose and the statement "Why, I've been overtemping engines for years and never had one blow up yet," does not belong in the vocabulary of a professional aviator.

3 **Know thy rules** – In these days of high speed machines, high density military and civilian traffic and complex missions, the rules are the edge between safely accomplished training and airborne chaos. The first problem most aviators face is coping with the volumes and volumes of rules, procedures and guidelines which are continually published, updated and changed. Units can ease the process and enhance the aircrew information retention level by some supervisory sorting, but the responsibility for rules compliance still rests squarely on the shoulders of the individual operators. You've got to keep up! If you don't, the results could at best be an FEB, or at worst, the conversion of you into a fatality statistic. Neither is worth the price.

4 **Know thine own limitations** – Closely akin to the knowledge of the rules is the appraisal which individual operators place on their own abilities. Minimums and maximums are just that – they are figures at each end of the spectrum with the operation of the machine falling somewhere in between. An aviator must use judgment and experience to adjust minimums up or maximums down if conditions dictate. Example – cracking a hundred and a quarter is a whole different ballgame toward the end of a 14-hour crew day than after a single hour and a half sortie. Temper those mins and maxes with conditions and don't be hesitant to add a safety margin because of your own reduced capabilities. Pride has ridden it in with some pretty good sticks.

5 **Keep thy body fi**
Generally speaking
flying is a physical
mentally demandin
business. I think no one will
that most aviators are better a
to cope with those demands i
are in reasonable physical sha
and well fed and rested. Anci
saying – They who burn the c
at both ends may soon be onl
ash! Nuff said!

6 **Respect mother nature** – The comn
about "not being ni
fool mother nature'
couldn't be more accurate. Th
best plan for an aviator is to h
basic working knowledge of w
phenomena. Vacuum out all th
available preflight weather dat
local weather shop can offer a
be ready for the worst. Religio
avoid thunderstorms and all of
associated surprises. Be wary
fickle crosswind, be skeptical
RCR figures. Simply stated –
thy assets, for the weather god
rarely on the side of the aviato

7 **Know thine enem**
This relates to the e
flying environment l
obviously primarily
combat weapons systems. Onc
you have the machine and bod
tune, the rules and limits firml
in mind – it is now time for so

listic training. Part of the success recent training has been the close ulation of the forces and threats the opposition. Knowledge of the my's capabilities will bring the ning and operations of a combat t into focus.

HOU HALT . . .

8 Not press – Tie all of the factors together and take the crew that knows and operates the chinery properly 98 percent of the e – the other 2 percent will kill n. This may be a result of the dency to "press." Call it rzealousness, overenthusiasm, r competitiveness or rsensitivity to command ssure, but for some reason that v feels the need to stretch or d the rules "for the sake of the sion." Note that the four criptive terms contain the prefix er." That is exactly the blem! Some competition and husiasm for mission and unit are olute necessities, but they have e under control. This is the ghest nut to crack!

Commanders and supervisors must be the impetus for mission accomplishment as well as the warning detector for "press-itis." As a supervisor, you constantly need to watch the troops for the signs of beginning to bend the rules. For a bomber crew it could be taking a shaky machine on a special post-alert sortie or pushing bad weather to get into a low level route on a "high priority mission." For an airlift crew it could be overloading the machine or stretching crew day for "a priority mission." For the fighters, it may show as going lower or closer before pullout, trying to hang on longer during engagements or again, taking shaky machines on "high priority" missions. Regardless of symptoms, the disease may still be terminal!

9 Honor thy wingman/crew – Only the single-seat, single-ship flier need not worry about this one. This is an unusual situation, however, as most USAF crew members spend the majority of their time either in multi-place machines or in formation. The name of the game is empathy! As a crew member, you need to be aware of the capabilities, limitations and *responsibilities* of the other folks in your aircraft or formation. If you don't have that awareness, the result could range from wasted time or sorties to inflight confusion and disaster. Know and understand the folks you fly with!

10 Remember the first nine! – Sounds dumb, huh! Not really – because as I mentioned, almost every aviator has heard the story before, but we continue to bash perfectly good people and machines into each other and the ground. We have heard it before, but maybe through mental lapses, outside pressures, stress or some other factor, we neglect a commandment and it kills us. Needless waste – sure! Tragedy – you bet! Is there an answer? I think so.

The answer to the prevention of needless flight mishaps lies locked in the brain of the operator. It is called attitude! It relates to all those time-worn but appropriate terms like crew coordination, conscientiousness and professionalism. Survival in aviation today takes conscious thought and effort to accomplish the mission *safely*! You have to force yourself to think about every move, every action, every maneuver and change. You have to have alternatives to every action which includes knowing the right way, the emergency way and keeping an ace in the hole! I submit when an aviation process becomes automatic, it is edging toward becoming dangerous. Reflex flying is a thing of the past and leaves too much to chance. If you're not thinking every second when you're flying, you shouldn't be flying! Fly smart. ■

FORMATION
Do's and Don'ts

LT COL HELMUT OBERBRINKMANN, GAF
Directorate of Aerospace Safety

■ Formation flight training is a requirement for readiness. But peacetime training does not necessarily require loss of lives, blood or high performance aircraft. When we read the Do's and Don'ts in the following mishap summaries, it doesn't look like a statement of professionalism, but rather how we sometimes do our flying job.

■ **Number 4 went lost wingman and hit number 3 when looking for the flight. . . .**

FINDINGS: The pilot did not follow the aircrew operating procedures of maintaining altitude separation when he lost his leader, but instead climbed to his flight's known altitude to try to acquire them visually.

■ **Number 4 hit number 3 while taking movies with his personal movie camera. . . .**

FINDINGS: In violation of TAC Supplement 1 to AFR 60-16, the pilot, operating his private movie camera, flew into his element leader.

■ **Number 2 and 3 collided while in a 180-degree cross-over turn. . . .**

FINDINGS: The flight briefing was deficient in formation procedures and abort contingencies. The formation leader did not take control of the situation before calling for another left 180-degree in-place turn. In this turn, numbers 2 and 3 failed to properly clear their flight path and collided.

■ **Number 2 hit lead during join-up. . . .**

FINDINGS: The instructor pilot in the number 2 aircraft allowed the student pilot to reach a position near the forward edge of the attack cone with high closure. When lead started to roll out of the turn, the student pilot erroneously perceived increasing horizontal separation and reversed abruptly from right to left bank toward lead without releasing back pressure. When the instructor pilot assumed control, it was too late to avoid the collision.

■ **Number 2 hit lead while level at FL290. . . .**

FINDINGS: Due to inattention to formation flying, number 2 failed to maintain separation and collided with the flight leader.

These are but a few examples which demonstrate why there is reason for concern with that which pilots do and which they don't do. All these mishaps were avoidable. They don't occur if the operator follows basic formation rules and procedures. I always thought and very often read: "Jet pilots do it better," but do they really?

The above examples make it h to believe. I think we must learn lessons from these catastrophic mishaps. Guidelines on how brie should be conducted and how to perform formation flying are contained in the aircrew operatio procedures of the command regulations. Undoubtedly, forma flying needs more than just keep the aircraft upright. It requires teamwork, good leadership and thinking ahead by each member the formation. Flight leads be aware — your wingmen are flying

Formation flying require teamwork, good leadership and thinking ahead by each member of the formation.

wing, using your aircraft as an cial horizon. Give them a ce to stay with you, especially n weather conditions are riorating. Successful teamwork ires professionalism and pline.

Wingmen must know and use ect lost wingman procedures!

The USAF cannot tolerate ul violation of directives!

Procedures are already en — we must make sure they ollowed!

Instructors should let the ent pilot make mistakes — only if still a learning situation and if it is not compromising safety! (The IP must not permit a student to jeopardize safety by allowing his mistakes to go too far.)

A successful formation begins with the flight leader. Does he really know his formation members? their capabilities and limits? their attitude and discipline level? And the formation briefing: Does it in fact highlight the Do's and Don'ts in accordance with the briefing guide? Does he make sure that each member exactly knows his task? Formation members must not hesitate to ask questions when in doubt. There is no room for assumptions, doubts or uncertainties. There is no "routine" in a formation mission. There are many variables such as the task, the weather, the environment, the operating altitude, the target, and the physical and psychological postures of each flight member. Think of all these items for a couple of minutes and delete personal traits like pressing, overmotivation, distraction and disobedience.

Let's eliminate the so-called "bold pilot's" briefing — you know — "kick the tire, light the fire, first one in the air is lead, briefing on guard!" etc., etc., etc. ■

The Last Milk Run

MAJOR BOB HAYDEN
Air Traffic Evaluation Staff
FAA

■ It was a milk run. An absolu
milk run and, although they nev
knew it, I almost killed 91 peop
After two and one-half years of
flying the C-130 Hercules in
Vietnam as a copilot, then aircr
commander, and now as an inst
pilot, I obviously knew just abo
there was to know about flying
four-engine tactical transport. A
all, we could put 30,000 pounds
ammo or equipment on board an
charging into short, unimproved
airstrips with 50 foot rubber tree
the far end of the 3,000 foot run
That's tough (!) and you have to
really proficient in your flying.
said I was good enough to teach
new guys how to do all that stu
Hadn't I flown 90 hours so far
month so my proficiency level
be right up there at the top? Or
been instructing other pilots and
was going to be my first landing
several weeks?

The scheduling people had be
working us pretty hard with lots
short field landings and long cre
days, so today, for a little relaxa
we'd play the airliner game, Vie
style. This meant our loadmaster
would rig up the canvas seats in
rear of the airplane and we woul

various and sundry military
ple plus wives, kids, and a few
nals around the southern half of
tnam. This also meant we would
nto only the larger (longer)
elds and not have to work as
to earn our salaries. We still
to worry about helicopters,
ced aircraft performance due to
100+ degree temperatures,
ther, fighters, other transports,
ible ground firing, but the
ings were gonna be easy.

everal of the fields on our
rary that day had some nice low
ngs and rain upon arrival, so I'd
able to give my student, an
rienced copilot upgrading to
aft commander, a good workout
s instrument procedures. He'd
so well, in fact, that I decided
ve him a rest and I'd fly this leg
Tuy Hoa, a twin runway fighter
located on the coast of the
China Sea. The weather was
isingly good considering how
had been earlier in the day.
ad the field in sight from 20
out and a good TACAN lock
we signed off with the tactical
people to start a visual
ach.

scending through 5,000, as was
ual custom for visual
aches, I requested the navigator
ne forward from his normal
position to stand near the front
w to give us an extra pair of
ooking for helicopters. I gave a
briefing to our 86 passengers
ne PA to make sure everyone
stened up and smokes put out
and turned my attention to the approach for landing.

We were instructed to set up a left base entry for runway 21 left. There was a light shower moving in from the north and the tower confirmed we'd have a tailwind for landing but only about 10 knots, so that wouldn't be any problem, and would save us about 5 minutes of flying time.

As we were on a wide left base leg and starting our turn to final, we entered the shower. "Okay, kid" I started to think myself through to the landing, "you're at 150 knots, 25° of bank and looking good. The copilot turned on the windshield wipers before you could ask for them. Guess he's even more ahead of the plane than I am. Better make this a good one, since you've been preaching techniques to the copilot, so it's either put up or shut up. You're rolling out on final, reducing airspeed to 132 knots and looking good. Okay, you have the airspeed pegged and a good glide-path. The runway is kind of hard to see with this rain, but I have the field and we'll break out of the shower at about a mile on final to make any last minute minor corrections. Now, what have you been preaching that needs practicing? Let's see, airspeed 132 knots, TACAN with a correction for its position on the field has us 3 miles on final, ADF is pointing the right direction, gear is down, altitude a hundred feet, flaps set, checklist is all compl . . . ONE HUNDRED FEET!"

I went on the gauges, increased power, set up a slight climb and, when we broke out of the rain at 1 mile on final, I was up to a normal glidepath. The landing was uneventful. As we shut down engines, I tested to see if my voice was back to normal and then asked the crew if they had noticed anything abnormal about the approach. The copilot, flight engineer and navigator all answered in the negative. At 3 miles final with only slightly restricted (we thought) visibility, we were 800 feet below a normal glideslope, 100 feet above the water and everything looked completely normal to four experienced aviators. At the time I initiated power application, we were in a 500 fpm descent meaning we were 12 seconds from striking the water.

How many accidents under the classification of "landed short" have been caused by just this same phenomenon of improper/apparent glideslope perception due to reduced visibility? For once, my preaching about using all available instruments for information had paid off. I do not quibble over the fact that I should have avoided the shower visually or requested an instrument approach. My complacency concerning tactical flying was instantly dissolved as well as the assumption that I couldn't make a mistake while on a simple VFR landing. There are no longer any milk runs. Some approaches and landings will be easier than others, but there will never again be a milk run for me. ■

OPS topics

MOVE OVER, RUDOLPH

■ Finding from a Mishap Report on a collision between a landing aircraft and a deer: "Shortly after touch down, a deer ran into the mishap aircraft." Move over, Rudolph, you've competition.

RWY XING— LOOK OUT FOR THE PLANES

■ Investigation of a near miss between a truck and an RF-4C on takeoff revealed some holes in the system that needed to be plugged. The tower controller cleared a barrier maintenance truck to enter the runway. He then went to the tape room to check a recorder but forgot to place the "VEHICLE ON RUNWAY" sign on the console. When the controller returned, the aircraft called ready for takeoff and was cleared. While the aircraft was rolling, the truck reentered the runway. The aircraft went by the truck just as the truck was leaving the runway. The policy was that once a vehicle was cleared onto the runway it could enter and exit at will. Now all vehicles must get clearance every time the driver wants to enter the runway. Also, the smart driver would look both ways—just as at a RR crossing.

HUMAN ERROR

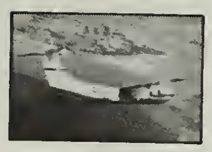
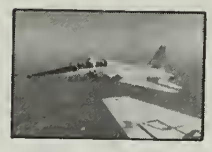
■ With the number of 'dromes that have parallel/multi runway operations, this is an appropriate topic. The left runway had been closed for an emergency, one aircraft was cleared to land and then the SOF was cleared on to make a runway FOD check. About the same time, a flight of two pitched and lead was cleared to land on the right. Number two called gear checked and was then cleared to land on the *left*. The controller was sure he had cleared Two to land right behind number one, b tapes confirmed that the cle had actually been for the lef number two aircraft lande missed the SOF truck by ab feet! Double lesson—contr need to take extra care with l and takeoff clearances to m runways. Crews—don't restr eyeball searches to the sky; cl runway visually in the final t aircraft, vehicles, animals,etc

CONFUSION MUST NOT REIGN

■ One can understand how troller might confuse two aircra flight of two, numbered, of c one and two. In this case A was a few miles ahead of Alpha both were being vectored. One pilots realized something was when he saw the airpatch pass his wing and that he was cross TACAN radial. After some c sation, the controller realized confused the aircraft and issue vectors. Meanwhile, however, 2 found himself on a collision with a nearby mountain. Gl WX wasn't IMC. Who knows

LESSON RELEARNED

■ Many years ago we were T-33s and didn't know why. cal scenario went like this: weather maybe, but not alway out of traffic after takeoff, crashes and burns. Pilot do escape. Finally, someone f out that about the time the pil making his initial turn after he had to make a frequency c That required him to look ba down which sometimes led

orientation and a crash. Recognition of the problem helped solve it, but the potential still exists, and we must be aware of it from drawing board, through test, and into operational use. Here's why. Shortly after takeoff, departure asked a flight of four to turn off their IFFs except for lead. Departure was having radar trouble. The flight entered clouds and nr 4 went lost wingman followed shortly by nr 3. Once the flight leveled in the clear, nr 3 rejoined, but there was no further word from nr 4. The aircraft had crashed with the pilot in his seat. A possible cause was that the pilot, in clouds, became disoriented when he moved his head to check the IFF switch.

G
ON

■ Not the first, and probably not the last, but bears reemphasis. The F-4 jock was on a tactical qual check and hit the "panic" button instead of the nuclear jettison button while backing up the release. The bags landed on the range with no further damage. Take care with the magic buttons and switches.

L
OAD

■ This jock was being vectored around low-altitude for an approach and full stop at a joint use field. During the course of vectoring, a requested speed reduction, and some instrument problems, the pilot extended and retracted the gear several times. After the last retraction the pilot punched off the gear horn and then flew the approach to a "smooth" gear-up landing. RSU had been unable to see the landing aircraft gear position due to water spray cloud created by a departing airliner. Another case of pure and simple distraction by intra- and extra- cockpit happenings. Also, *when landing,* you turn that obnoxious horn off with the gear handle!

COULD HAVE BLOWN HIS WHOLE DAY

■ The crew member was unloading his gear and had stowed an equipment bag along the side of the ejection seat. As he removed the bag, the integrated harness release lever was contacted, the zero delay initiator fired and the man seat separator was actuated. Only replacement of charges was required, but the point is—take care in the stowage of gear, pins, checklists and other junk. It could foul up the machinery and work when you don't need it or *not* work when you do.

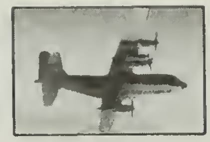
A BUS AND A POST

■ Once upon a time, one Murphy uttered a profound statement which was immediately proclaimed by the King to be an irrefutable law. There are many versions as to what Murphy really said. Here's one translation: *If there is an object on an airfield that can be struck by an airplane—it will be.* For example, a C-141 was taxiing to a parking spot. As the aircraft made the last of three 90° turns, the left wing struck a parked bus. There was a marshaller, no wing walkers, the light was poor and the A/C and scanner *thought* there was enough clearance. There wasn't.

Fighters, too, blunder into things on the airpatch. An F-15 managed to ding a wing on a fence post. The aircraft was turning into a quick turn spot. The pilot didn't see the post and the marshaller had moved from

continued

continued



the pilot's one o'clock to his 11 o'clock position. This put the aircraft between the marshaller and the post. There must be a better way.

LEAKER

■ Passengers on aircraft sometimes carry strange things. But an automobile battery?? The battery was in a box, but when the passenger changed planes at an intermediate stop, the crew of the next aircraft discovered the box was wet from electrolyte. Also, fluid was found on the floor of the forward baggage compartment. The A/C of the C-9A then refused to allow the battery aboard. Crews must be vigilant because pax don't all realize what happens to fluids in closed containers at altitude.

BELTIN' BUZZARD

■ Here's what happened when an F-4 and a buzzard collided. The canopy plexiglas shattered leaving a hole approximately 2 feet long (front to back) and 2½ feet wide (top to bottom). An immediate climb and throttle back was accomplished and an emergency declared. The aircraft was led back to base for a straight-in approach and uneventful landing. Both crewmen were unhurt.

LIGHTNING STRIKE

■ What's it like when your aircraft takes a lightning strike? The aircraft was struck just after entering a heavy rain shower at 9,000 msl. According to the pilot, the flash appeared to go over his head and he was aware of a tingly feeling. Both aircraft altitude indicators tumbled, accompanied by loss of directional gyros. The radar scope remained on a stable platform continued to normally. The pilot used th artificial horizon, pitot instr and the turn-and-slip indic maintain aircraft control. Tl informed RAPCON of the li strike and requested a no-gy approach. The attitude and tional gyros started erection approximately 30 seconds a lightning strike and were con erected in two minutes. Re and landing were accomplish all systems functioning no At no time prior to or after th ning strike did the pilot en any turbulence associated w weather conditions.

A HAIL OF A PROBLEM

■ July is right in the middle hail season in the northern sphere. The season starts spring and is just about over end of September. When w flying lower and slower in rec picked up a lot of hail damage such damage is fairly rare. Ho that can lead to complacenc or a lack of appreciation as t those balls of ice can do to an a —any airplane. The answ course, is *avoid hail locatio* close attention to the WX b approaching Cu, use radar have it; otherwise, call metro. times nothing seems to work a find yourself facing a line of T Don't go for the sucker hol bet is to do a 360 to gain altitu top the weather. Try a trough hail is present, expect it both cloud and downwind in the S'no fun explaining all dents. ■

THE PROFESSIONAL APPROACH

AIR FORCE COMMUNICATIONS SERVICE
SCOTT AFB, IL

OR Y

Have you ever tried to listen to several people 10 are talking at once? That's what has been hap- ening to some of the black boxes in your aircraft. oliferation of ground navigational aids has com- etely saturated the authorized frequency band d created mutual interference problems. Basically ee factors combine to create this problem: (1) e limited space available in the frequency spectrum the inability of transmitting equipment to confine iissions in a very narrow band, and (3) inability avionic receivers to reject all unwanted signals. thing can be done about the crowded frequency ectrum; however, technology and a lot of dollars ve greatly reduced the impacts of factors 2 d 3.

3y using more sophisticated electronic equip- nt, many of the adjacent frequency interference blems have been eliminated. This has permitted insertion, in the same frequency band, of ad- onal channels of authorized operating fre- encies. You will soon see VOR and ILS frequencies olished with an additional digit, such as 109.35. course, your avionics will have to be capable of ng tuned to the published frequency. In the CAN/DME band, juggling of the reply frequencies pulse spacing has allowed the insertion of an litional 126 channels in the same frequency d. These additional channels will operate in "Y" mode and will be identified by channel num- and the "Y" suffix.

or you, the pilot, the only difference between mode and the "X" mode which has been the dard mode since DME/TACAN inception, will he DME/TACAN mode selector switch in the kpit. All newer generation airborne DME/TACAN ems will have an "X-Y" select switch on the rol head. The mode selector switch must be ed to the correct mode for the DME/TACAN em to operate correctly.

with the present "X" mode, the 126 new "Y" e channels will be frequency paired with the VOR/LOC frequencies when the facilities are cated. This is done for users who have VOR/ ; the correct DME channel will be automatically tuned when the VOR frequency is selected just as the glide slope frequency will be automatically selected when the localizer is tuned. If DME is installed with a localizer facility, tuning of the localizer receiver will automatically select the paired glide slope frequency as well as the correctly paired DME channel.

Most USAF aircraft have separate control heads for DME/TACAN and VOR/ILS. The frequency/channel selection is made by tuning the individual control heads. Preliminary implementation of the "Y" mode DME/TACAN will be limited to some tactical military situations. Full implementation will require retrofit of ground stations as well as avionics and will not take place for some time. Operation of the newly available VOR/ILS frequencies is contingent only on avionics capability and limited implementation can be expected shortly. There may be a possibility of military only using the "Y" mode paired ILS frequencies. The new total system implementation will be keyed on general aviation use. The following chart shows a sample of some of the ILS frequency pairings and use. Note that the new VHF frequencies, which all end with the digit 5, are paired with DME/TACAN "Y" channels.

Thanks to CMSgt Tony Haus of HQ AFCS/FFOO for this article. If there are questions about X and Y modes, you should direct them to the Chief at AUTOVON 638-4451 or to Flight Standards at AUTOVON 638-5479. ■

VHF/UHF NAVAID FREQUENCY CHANNELING AND PAIRING

Channel	VOR mHz	DME/TACAN				ILS	
		Airborne		Ground			
		Int. Freq. mHz	Pulse Code usec	Reply Freq. mHz	Pulse Code usec	Localizer mHz	Glide Slope mHz
26X		1050	12	987	12	108.9	329.30
26Y		1050	36	1113	30	108.95	329.15
27X	109.00	1051	12	988	12		
27Y	109.05	1051	36	1114	30		
28X		1052	12	989	12	109.1	331.40
28Y		1052	36	1115	30	109.15	331.25
29X	109.2	1053	12	990	12		
29Y	109.25	1053	36	1116	30		
30X		1054	12	991	12	109.3	332.00
30Y		1054	36	1117	30	109.35	331.85
31X	109.4	1055	12	992	12		
31Y	109.45	1055	36	1118	30		
32X		1056	12	993	12		
32Y		1056	36	1119	30	109.50	332.60
33X	109.6	1057	12	994	12	109.55	332.45

NEWS FOR CREWS

Career information and tips from the folks at Air Force Manpower and Personnel Center, Randolph AFB, TX.

COLONEL HENRY VICCELLIO, JR.
Chief, Rated Officer Career Management

ENHANCING THE RATED OFFICER'S ROLE IN THE ASSIGNMENT PROCESS

■ The centralized assignment mode we operate under today at AFMPC offers lots of benefits that can't be attained in any other way. These benefits become increasingly important as our rated inventory – both pilots and navs – falls below our total requirement. While UPT/UNT rate increases are programmed downstream and will help somewhat, the shortages are real and are here today. Finding the right person for the job is much easier when one agency that's both familiar with and responsible for filling the requirements of *all* users can look at the total resource to select and assign. All classic jokes about the "big picture" aside, it really works well when things get tight, as they are now.

At the same time, however, centralized assignments don't come without costs. While a few perceived problems still stem from a more traditional view of decentralized resource management, a more individually oriented set of concerns is the central topic of this article. In essence, many rated officers today feel that their role in the assignment process is unsatisfactory. If serving for nothing else, I hope this article convinces you that changing that perception currently has not only my top priority, but the dedicated support of the officers, airmen, and civilians who work with me here at AFMPC.

The perception that things aren't right is expressed in many ways. In the year and a half that I've been here at MPC, I've heard the most common complaints many times over:

■ "I don't understand how you guys operate – my assignment just doesn't make any sense!"

■ "Doesn't anybody read my Form 90? I don't want a staff job!"

■ "I can't ever talk to anyone at MPC – the phones are always busy."

■ "You guys will never convince me that the computer didn't make my assignment!"

In trying to cut through the emotionalism that often clouds real reasons for dissatisfaction, several points stand clear. First, rated officers need and want to know more about the assignment process – what the requirement structure really looks like, what jobs are available, and how assignments are made. Second, communication between rated officers and their resource managers to be improved – the Form 90 will be revised to m more compatible with our new procedure, its u officers should be improved, and we see more writ telephone contact during the assignment cycle as ess Finally, the immediate commander's role in assign could stand some improvement. Often he could or s provide a decisive input, but has no institutiona of doing so.

We've implemented several key initiatives ov last 18 months to help combat these problems, and th proven productive. First, we've expanded our "s the-word" effort, which is primarily aimed at the tion and communication shortfalls I mentioned From 34 trips to the field in '77 we increased to '78, and are on the same fast track in '79. If you h seen one of us in the last year or so, you're in a d minority, since we've looked over 20,000 rated o in the eye during that period. While there will alw come disgruntled souls and B.S. flags, the feedbac these trips has been overwhelmingly positive. I ho USAFE officer who complained to the *AF Time* year about MPC's "sunshine briefings" caug act, because our money is made by telling it like and most people appreciate it.

The second major change in the way we do bu is the institution of the Rated Officer Review (RORB) – the forum by which we systematically the records, assignment preferences, and correspon folders of both the "availables" (officers on the due to controlled tour completion) and "eligi (officers with the first gate met who are PCS-eli This forum, which starts off the assignment cycl really driven home the point about communication lems – over half of *all* rated officers have a Fo that's over 2 years old, and a much higher perc are unusable due to outdated or unrealistic assig preferences. We've got to change that picture RORB or any other improvements are to realize full potential.

Although these two initiatives have helped us to nize and often overcome the problems of educatio communication, they've also convinced us that t lots of room for further improvement. Toward tha

're instituting some major revisions to the assign-nt process that are aimed at enhancing the role of h the rated officer and his immediate commander. with the spread-the-word and RORB efforts, our basic ls are education, communication, and participation. don't feel that we're shooting in the dark, either. Our as come from some very solid successes we've had en events, timing, and resources allow us to really centrate on a relatively small group of rated officers. ignments made during recent fighter squadron con-ions, in preparation for unit deactivation, or as a part ne SAC northern tier program have been worked more a face-to-face basis, with resource managers visiting units or calling individuals one or more times to ine what jobs are realistically available and discuss—on-one—assignment preferences and other career elopment considerations. Higher volunteer rates, e satisfied customers, and fewer separations from assignment efforts tell us that dramatic improve-ts in our day-to-day operations are possible. With e successes in mind, our basic game plan is to apply enhanced approach on a worldwide basis to the mum extent possible—recognizing that a field trip 1 face-to-face discussion on every assignment isn't y feasible.

ere are five key elements in our plan for revision. following is a brief description of these, together how they will play in the assignment cycle itself:

We're developing a document known as the Assign-Information Directory (AID), which will be lo-at each CBPO and with every flying squadron nander. This document will be updated semiannually vill outline career patterns and assignment options/ bilities for various groups of rated officers. The of job, geographical locations involved, and re-d qualifications will be included. What's happening e Rated Supplement and Departmental/Joint arenas also be included. The AID is the cornerstone of we hope to accomplish. It should provide a common of departure for the individual, commander, and rce managers. We hope it will form the basis for oved and useful communication, be it through ge, letter, phone call, or Form 90. Our first attempts e somewhat rough and wide of the mark. Based on ience and feedback, however, we feel that this nent can be made to function as we all need it to.

Ten months prior to an individual's available date, the point when his/her eligible-for-overseas status tes potential reassignment, or when he/she becomes g the most eligible volunteers for a projected require-we'll send out a letter requesting Form 90 update. letter will also suggest commander/supervisor ement and indicate the current edition of the AID najor source of information on available options. FMPC point-of-contact for any discussion during 90 completion will also be included. We'll expect an updated Form 90 during the month following notifi-cation.

■ A simultaneous letter to the individual's commander or immediate supervisor will advise that the individual is entering the assignment cycle, suggest the commander's participation in Form 90 deliberations, and request a voluntary parallel input on suggested assignment.

■ Although the current Form 90 lends itself to these concepts and procedures, proposed revisions are under-way which will enhance the form's utility and adaptability to the Personnel Data System. We sincerely want to over-come the perceived "lip service" or "dream sheet" image of the Form 90 and make it something meaningful. The first few hundred rated officers who get their forms returned due to lack of currency, realism, or utility will hopefully convince the rest that we're serious!

■ If the individual's desires for reassignment as ex-pressed on the Form 90 can't be met, follow-up com-munication involving the resource manager, the indi-vidual, and the commander will ensue so as to either negotiate an alternative or explain the necessity of the mismatch. This is going to be our toughest step. First, we'll have to contact thousands of folks on whom we'd simply lay an assignment under past practices. The "best interests of the Air Force" may still be our bottom line, but we're taking on an expanded responsibility to explain —hopefully to your satisfaction—the "whys" and alter-natives when your desires can't be matched. How well we meet this challenge remains to be seen, but I guarantee our very best shot.

Realizing that this revision represents a major change in the way we do business, a few preparatory steps are currently underway. First, we plan on adding a few more resource managers and NCOs to handle the increased administrative load. We're expanding our telephone capability to include priority overseas AUTOVON lines to enhance communication prospects. Most importantly —at least from our view—we're going to ease into the program. We're going to start working all European returnees and the worldwide FAC/ALO force in June. Since the program has a 10-month lead time, we're talk-ing about April 1980 DEROS or FAC/ALO tour com-pletions. Our test group will involve rated officers of all backgrounds and in all jobs, rated or supplement. If the ideas prove practical, we plan to expand the new approach to all rated officer assignments by September of this year.

In summary, we feel we're setting off on a rather ambitious project, but one that offers a good chance for success—from everybody's viewpoint. The feedback from our numerous visits to your units and the successes we've had in particular circumstances convince us there is both need and room for improvement. We're hoping that the elements of our game plan will provide what's needed: more information about slots you qualify for (the AID), notification to you and your commander when

continued on page 22

MAIL & MISCELLANEOUS

CHAIN TO DEATH (AEROSPACE SAFETY, MAR 79)

■ Although I agree with Maj Harvell's thesis in the subject article, he makes a statement which caught my attention as being invalid. In his story, the aircraft was below minimum control speed at the time of loss of two engines. This made the accident "inevitable."

In my opinion the accident was inevitable, only in that the pilot was not trained or self-conditioned to realize directional control problems can be corrected with power as well as conventional control surfaces. Time and time again, we read of accidents very similar to this where the reduction of power would have permitted the pilot to maintain control. Admittedly it would not always avoid an accident, but the pilot could at least execute a controlled crash which would improve the probability of survival.

As in any emergency, one fares much better if the mind has been conditioned to respond. It behooves all multi-pilots to train themselves to think in terms of throttles for directional control when "full everything else" doesn't get it.

RICHARD E. NADIG, Lt Col, USAF
Sacramento Air Logistics Center
McClellan AFB, CA

Lt Col Nadig makes an excellent point when he states "It behooves all multiengine pilots to train themselves to think in terms of throttles for directional control when 'full everything else' doesn't get it." You have to fly the airplane until it stops; then you must get "the heck" out of there in the most expeditious manner. However, the conclusion that this accident was inevitable at the time of loss of two engines, along with the facts of this mishap, was taken directly from the Air Force mishap investigation report reflecting the opinion of the experts on the mishap investigation board.

I appreciate his response to the article, and I'm going to incorporate his ideas in my emergency response training.

KENNETH S. HARVELL, Major, USAF
20th Bomb Squadron
Carswell AFB, TX

FREE PEN AND PENCIL SETS

Aerospace Safety magazine is produced for aircrews and the people supporting them in such fields as air traffic control, life support and flight operations, and commanders and supervisors of aircrew personnel.

We attempt to print educational material of value to our readers in the prevention of aircraft mishap[s]. [Most] articles are short and sim[ple, but oc]casionally, because of the su[bject, an] article will be fairly long an[d some]what complicated. Harder [to read] and comprehend. We offer t[hese be]cause military air operations [are not] always short and simple. So[metimes] intense concentration and st[udy are] required to master the nuan[ces of a] technical article. But we fir[mly be]lieve that the more one know[s about] the many facets of aircraft op[erations,] the better equipped to safe[ly com]plete the mission—every tim[e.]

We invite you to commen[t on] magazine contents, and soli[cit] ideas for subjects you'd lik[e] covered. We also invite you [to write] for *Aerospace Safety*. We c[an't pay] for articles but we will send [a] quality pen and pencil set to [authors] of published articles. For m[ore info] write or call AUTOVON 87[...] Thanks. ■

News For Crews continued from page 21

you're coming up for likely reassignment, a revised Form 90 to help you better frame your desires, and, finally, as much direct communication as needed between you and the guy here at MPC that'll make your next assignment. It's not so important that we reduce the number of witty comments or complaints about our services. What is important is that only through active involvement among you, us, and your commander can we all work toward incre[asing] your understanding of and [satis]faction with that next assign[ment.] Let's get and stay in touch.

ABOUT THE AUTHOR

Colonel Viccellio is currently C[hief,] Rated Officer Career Managem[ent,] AF MPC, and is the key driver [in] the institution of this new assi[gnment] process. His background include[s] in the F-100 and A-1, and duty [as] F-4 Ops officer, squadron com[mander] and ADO in the 33TFW at Eglin [AFB,] FL.

aghtnin' 'traaks

uring the recent penetration
e Venusian atmosphere by
A probes, lightning seems to
 been detected. If so, Venus
Earth have something in
non.

's imagine what it's like on
eighboring planet where the
her is IMC 100 percent of
me. Joe Smud'lipl, Capitan
sian Air Force, faghter palot,
lass, is on a terrain following
ce mission. The aircraft
 over volcanoes and dips
 into valleys covered with
lering boulders. Suddenly
rcraft pitches up and gains
 feet before Smud'lipl can
de and level out. Then it
nters a shower of liquid
 and sulfuric acid. As the
t exits the shower, there is
endous flash and a loud

itan Smud'lipl immediately
 the mission and RTB,
 the maintenance and
 folks gather around, look at
holes burned at the base of
ot probe and sagely agree:
n' straak.

Meanwhile, a crew on Earth was climbing in IMC when they broke out and saw a buildup straight ahead. The IP immediately began a turn and advised Center. Just then the crew saw a flash at 12 o'clock and heard a bang. The right engine rolled back and flamed out.

After declaring an emergency and restarting the engine, the aircraft returned to home base. No engine damage could be found, and it was theorized that the combination of the turn and lightning strike disrupted the air flow and caused the flameout.

What probably happened to both these aircraft was that they became links in the connecting channels between cloud and ground. Lightning is just a long electrical spark between centers of opposite polarity (figure 1). If the aircraft is near the charge center or an advancing leader (the traveling spark), the aircraft may become a part of the conductive path. When the current reaches an opposite charge, there is a return stroke which is responsible for the bright flash and loud bang.

Most strikes occur in clouds, but sometimes they happen in the clear, miles from a cloud. Most strikes occur between 5,000 and 15,000 feet, but they also have been reported from 1,000 feet to over 37,000 feet. Usually the outside air temperature is within a few degrees of 0°C.

The best way to avoid a strike is *avoid thunderstorms*. Give them a wide berth; otherwise, you may take a strike miles from the nearest cloud. Another technique is to stay away from the 0° level in weather. However, that is no guarantee, since the second example given above (the one on Earth) occurred when the aircraft was 10,000 feet above the freezing level.

Think of the typical aircraft lightning strike:

Aircraft flying at 10,000 to 15,000 feet, within a cloud, experiencing light rain and light turbulence and the OAT is near 0°C.

Don't be disappointed if your aircraft has never been struck. Sometime, someplace when you least expect it, it will! ■

Fig. 2. Altitude where most strikes occur

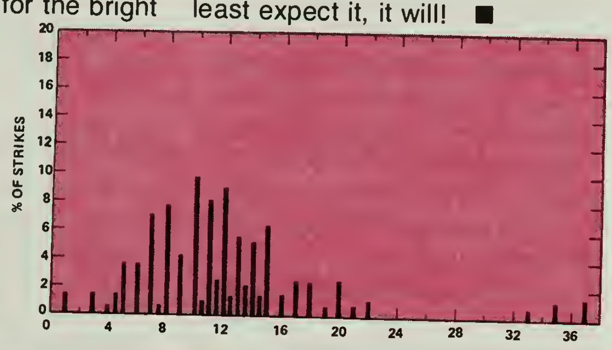
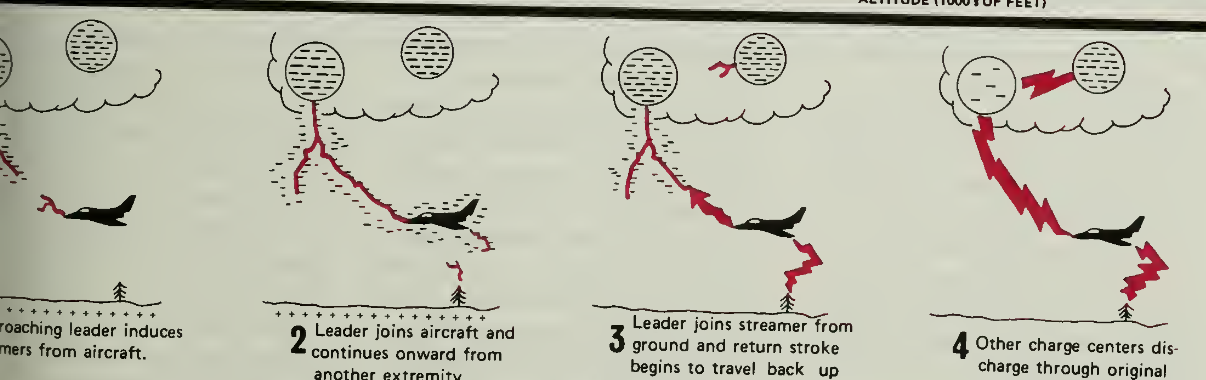


Fig. 1. Strike sequence.



SURVIVAL

The Sea and Thee

SSGT ALFREDO VARGAS
Operations and Requirements Branch
3636th Combat Crew Training Wing
Fairchild AFB, WA

■ The impact and the cold water took Captain Salvo's breath away, but before he was completely submerged he released both sides of his parachute and waited to surface— waited— and waited. Just before panic set in, he realized that he had not inflated his LPUs. He instantly started looking for those little black knobs. It was only seconds until he found them, but to Captain Salvo it seemed like an eon. Once he activated them he popped to the surface. All he could think of was how good it was to breathe.

Although he was pleased to have landed and have his head above water, he was in shock. He made no effort to organize his predicament. He just stared at the horizon. The blending of the ocean and the dark sky gave him the feeling that he was in a dark blue bottle. This feeling was so intense that his parachute harness, LPU, vest, and helmet seemed to crowd and confine him. In an attempt to relieve this anxiety, he removed his helmet. The cold wind which chilled his soaked head brought him back to reality, but once again he looked at the dark clouds which were still as ominous as they were when he first entered them in his Dart.

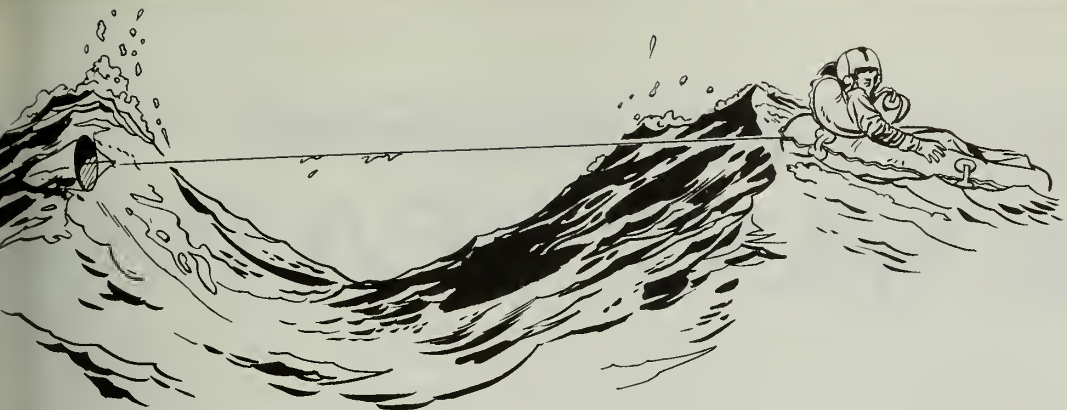
Captain Salvo had experienced Saint Elmo's fire, but getting hit by lightning was something else! Every instrument in the cockpit went out which left him completely disoriented. He ejected.

He landed in front of the storm, but he knew it wouldn't be long before it would sweep over him. His raft was nearby so he started to swim toward it. After numerous unsuccessful attempts, he remembered the lanyard tying him to the raft. After that, it was easy— that is, until he attempted to climb into the thing. Every time he pushed the small end of the raft down into the water, the wind which was now gusting would blow it into him and eventually over his head. In the pool during continuation training he had no trouble. This was different. Frustrated, he pulled the raft toward him and was about to try to board it again when he spotted his open J-1's (quick releases). The closing of the J-1's was like a proverbial "light bulb" for he remembered that the wind had to be at his back when boarding a raft.

Once in his raft, he let out the sea anchor and attempted to make radio contact, but to no avail. He brought in the rucksack containing the survival gear and inventoried the equipment in both his vest and the rucksack (see list on next pag

The wind and the waves in and the cold was beginning t his bones; therefore, he tucke the gear between his legs and proceeded to inflate the floor was working on the spray shi when the world fell out from him. From out of nowhere ca huge waves. One moment he the crest of a wave and then in the trough, landing with a hard that he almost swallowe oral inflation tube. Before he recover he was engulfed by a of water which pushed him d and under. Ten gallons later surfaced, no longer in his raf

Just as he pulled the raft to and was at the top of another the raft was jerked out of his Had he held on, it would hav an instant replay. As he crest next wave he spotted the culp When his raft was at the cres wave, the anchor was on the the following wave and in th when the raft was in the trou This caused the anchor to pul raft through the wave. After effort, he pulled in the ancho boarded the raft. He didn't w drift with the storm so he let anchor out, adjusting it so it be in the crest when he was i



gh and vice versa.
'ith the inflation of the spray
ld complete he began to feel
er. He bailed most of the water
of the raft with his helmet,
:h seemed to make the raft
nce more, so he let some of the
ut of the raft. More
fortable, he settled back and he
ed in his rucksack, only to find
npty. He'd left the zipper open!
e could do was to console
elf by knowing he still had all
ignaling equipment in his vest.
ept looking and listening for
to arrive, but could see only
angry clouds being twisted and
d by cold wind. The rain,
n had been hard to differentiate
the ocean spray, was now a
g rain that smarted on every
ed part of his body.
could feel the raft bottom fall
om under him from
o-time so he knew it was time
djust the sea anchor. However,
nd, rain, and periodic thunder
nced him to postpone it for a
and instead, try to conserve
ittle heat his body could
ce. He completely enclosed
f within the spray shield.
as he started to feel warmer,
mach began to rebel and he
sly pulled on the velcro which
e shield closed. While flailing
trying to get his head out, he
rned the raft and found
f trying to vomit underwater.
nd, blasting spray and rain on
e, accompanied by what now
extremely loud thunder,
drove him to panic. Turning
ind, he spotted his raft and

proceeded to pull it towards him. The cold made every part of his body stiff and painful. Captain Salvo's efforts to get into the raft were in slow motion when compared to the movement of the raging sea, but somehow he managed and again adjusted the anchor. Cold and weak

SURVIVAL CHECKLISTS

SURVIVAL KIT	VEST
Life Raft	PRC 90
Sleeping Bag	Gyro Jet Flares
Matches	Mark 13 Flares
Raft Repair Plug	Compass
Sea Dye Marker	Tourniquet
AFM 64-5	Two Fire Starters (N-2)
Desalter Kit	Matches
Wool Socks	Whistle
Space Blanket	Strobe Light
Snow Goggles	Mirror
5" Knife	MC-1 Knife (Switch Blade)
File	2 Quart Water Bag
Fishing Kit	
URT-33C	
Water Can	

from frequent vomiting, all he could do was huddle inside the raft.

Although dazed and weak, he realized he needed water to drink; however, the thought that he would not be out there long cancelled any effort to procure rain water. By nightfall, he was only semiconscious but he could sense and feel that the storm was beginning to subside and this increased his hope of being rescued. As the storm decreased to a soft rain, Captain Salvo tried to relieve the burning in his throat by drinking water which collected in the indentations of the spray shield, but ceased when the salty taste irritated his swollen throat and tongue. He realized how swollen it was when he tried to transmit on the radio and could barely speak. He did the next best thing and that was transmit a beeper tone every few minutes.

The search aircraft which first located Captain Salvo did so because they picked up a weak beeper tone which was barely audible. They figured it had been on all night.

Captain Salvo made some serious mistakes — but he did some things right, too. The closing of the J-1's prevented the puncture of his raft and possibly his LPU's. His failure to close his rucksack, combined with the initial maladjustment of the sea anchor, caused the loss of his equipment (primarily his 2 cans of water). In spite of all this, things didn't get serious until he failed to prepare for an extended survival situation by replenishing his lost body fluids. The lower the fluid level in the body, the more difficult it is to replace. Therefore, it is important to take small drinks continuously, especially if you're vomiting.

We all must realize that not only does it behoove us to maintain ourselves in excellent physical and mental condition to do our job, but to know the operation of those things we have to do our job with. Should we ever find ourselves in a true survival situation, the maintenance of these ideals (physical and mental capabilities) can easily mean success or failure. Now's the time to prepare for that thing that only happens to "the other guy." ■

Off-base crash response
FOR WANT OF A NAI

LT COL CLEVELAND SIMPSON
Directorate of Aerospace Safety

■ Everyone knows the old, proverbial story about the events that transpired when the horse lost a shoe for want of a nail. While this may seem far removed from the business of aerospace safety, a recent aircraft mishap was disturbingly similar and sharply illustrated the moral of the story.

The mishap involved a T-33 on a cross-country navigation proficiency flight which suffered an engine failure in flight. The aircraft had just departed on the first leg of the flight and was passing through 28,000 feet at full throttle when the pilot heard a loud explosion. This was followed immediately by several aircraft vibrations and a rollback in engine rpm. The pilot moved the throttle to idle, engaged the gang-start switch, and lowered the nose of the aircraft to obtain glide speed.

Although there was no fire or overheat light illuminated at the time, an emergency was declared with the controlling center as airstart procedures were continued without success. Unable to restart the engine, the pilot left the throttle at idle and flew a flameout pattern to a successful landing on a dirt runway at a small civilian airport.

This would normally mark the end to most in-flight emergencies, since getting the aircraft on the ground successfully is the most important part of the battle. However, that was not to be the case in this instance as, unknown to the pilot, an internal engine fire had developed while the aircraft was still in flight. The fire apparently started from engine oil escaping into the hot section through a crushed number 4 bearing. It was subsequently determined that the bearing was crushed as the result of a fa turbine wheel. The failed tur wheel also released three tu blades which tore a hole in t right side of the fuselage.

The first indication of an a fire had come via a citizens (CB) radio transmission fron unidentified motorist who observed the aircraft during flameout landing. The CB transmission was noted by a volunteer fireman living approximately 7 miles from civilian airfield, and crash response procedures were initiated in accordance with agreement for mutual aid in protection between the near Air Force base and county f department authorities. The became aware of the fire wh smoke billowed forward into cockpit as he opened the ca In addition, while egressing, noticed small flames in the

ne seciton of the engine
igh the hole in the side of the
aft.

efighting equipment was
atched to the mishap scene
two civilian units, one
ed 7 miles away and one
ed 25 miles away, with the
equipment arriving shortly
the aircraft landed. From
oint on confusion set in, and
tuation rapidly deteriorated.

st, the pilot contacted the
st Air Force installation (40
away) and informed the
and post that he had
d safely and needed
hting equipment, since the
n field had none and the
ft was still smoldering. The
and post informed the pilot
refighting assistance was on
ay, and that a rescue
pter was on its way to pick
o.

ond, the first civilian
ting unit to arrive on the
discovered that their
nent was not adequate to
n an aircraft fire. This
ation was relayed to the
ommand post; however,
authorities stated that
hould be no problem once
nent from the second unit
.

e meantime, the initial, oil-
gine fire gained in intensity
and gradually spread, feeding on fuel and magnesium components in the aircraft structure.

Equipment from the second civilian firefighting unit finally arrived; however, it was discovered that it, like the first, was also inadequate to contain an aircraft fire. As a result, no attempt was made to extinguish the fire and the aircraft became totally engulfed in flames. Civilian authorities subsequently contacted base authorities via the civil defense net and requested equipment to fight a magnesium fire. By this time, the aircraft was 70 to 90 percent destroyed.

Military firefighting equipment with aircraft fire suppression capability was then dispatched from the base — more than 2½ hours after the command post received initial notification! Unfortunately, the aircraft was totally destroyed before the base equipment arrived on the scene.

This mishap is an unfortunate example where a fairly minor inflight emergency was allowed to develop into a major mishap because of inadequate crash response. The pilot did an outstanding job of handling the inflight emergency and getting the aircraft on the ground. From that point on, it should have been routine for military and civilian firefighting authorities to control the engine fire and limit aircraft damage. Adequate plans/mutual aid agreements had been established to handle contingencies such as this; however, they were not executed properly by either the base or civilian authorities.

Early in the mishap sequence, no attempt was made to determine the type equipment required or that such equipment had, in fact, been dispatched. As a result of this incomplete coordination/communication, equipment dispatched to the scene was not adequate to suppress an aircraft fire. Although civilian authorities responded to the emergency in accordance with the intent of a mutual aid agreement, they failed to first determine the type equipment required. For their part, base officials not only failed to verify the adequacy of the dispatched civilian equipment, they also failed to dispatch necessary equipment from the base until too late to save the aircraft.

The lessons of this mishap are obvious. Units must not only ensure that adequate plans for mutual aid in fire protection and off-base crash response are established, they must also ensure that these plans are executed properly and expeditiously once an emergency occurs. Had this been done in the case of this mishap, damage could have been minimized and a valuable aircraft could have been saved. ■

For want of communication and coordination, confusion set in. Here are the dramatic and frustrating consequences.

Letters To Rex

Neat Preflight Planning Technique

■ Walking through the Flight Planning Room the other day, I noticed a transient aviator taking an extra step in his preflight planning. He said it was an old trick, but I thought I'd share it with you. He had taken the SID he was planning to use and was comparing it with an instrument approach chart for the airfield. Obstructions for the field were not on the SID, but they are on the approach plate. The approach plate also shows minimum and emergency safe altitudes as well as bearing and distance to local NAVAIDS. He was also getting a quick familiarization with the approaches available in case a landing became necessary immediately after takeoff. He stated that this step took only a couple of minutes and was well worth the effort.

Chief Airfield Management

Dear Chief,
You bet! Any extra info that aviators can obtain and digest prior to takeoff is super insurance!

VIP Flights Advance Notices

On occasion, many of your readers transport VIPs around and might, therefore, profit from the following saga: A T-39, Code 4 aboard, was inbound to Zippo AFB with an ETA of 1000L. When the aircraft was approximately 150 miles away, somewhere near Snart, WV (which is near Zummie AFB, WV), the pilot contacted Zummie Base Ops on pilot-to-dispatcher and requested that they advise Zippo that the aircraft would be 35 minutes early. The word Zippo got, however, was that the aircraft would be 5 minutes early. An aircraft that is 5 minutes early is nothing to get excited about but one 35 minutes early, especially carrying a Code 4, does create excitement. Anyway, the aircraft sure enough arrived 35 minutes early and nobody, save one captain from Base Ops, was out to meet the Code 4. Well, in short, the VIP was upset because he was on a tight schedule and Base Ops spent the next 2 hours trying to figure out what happened. The pilot was on the right track when he called Zummie Base Ops. If, however, he had advised Zippo 15 or 20 minutes out, Zippo would have been ready. This same situation can occur on flights of short duration, i.e., Kelly to Randolph or Norton to Las Vegas. In this situation, ask the Base Operations personnel to advise the inbound base on the AUTOVON that you are inbound carrying a VIP. The destination base will certainly appreciate the advance notice and, of course, the VIP will see what a super planner the pilot is.

Scarred Protocol Type

Dear Scarred,
Good point!

Tip of the Hat to Grissom

Just wanted to pass on s
good words about the TA f
Grissom AFB, IN. One of r
crews recently diverted the
into Grissom with hydraulic
problems. Even tho a trans
aircraft, the crew (and brok
machine) received superb
assistance in getting back
road again. If you can pas
my thanks, please do!

T-39

Dear CO,
Done, and thanx. ■

·U.S. Government Printing Office: 1979— 6

TATES AIR FORCE

Well Done Award

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CAPTAIN

Robert D. Williams

461st Tactical Fighter Training Squadron (TAC)
Luke Air Force Base, Arizona

■ On 3 August 1978, after a normal runup, takeoff and climb to approximately 100 feet in an F-15A, Captain Williams' aircraft developed a critical loss of thrust and began settling toward the ground. The rpm gauges revealed both engines winding down. Suspecting double engine stagnation, Captain Williams rapidly retarded both throttles to idle and readvanced them to check for any response. The left engine had stagnated and, therefore, did not respond; the right engine accelerated to 85 percent and began surging violently. To further complicate matters, the control augmentation system had disengaged, and attempts at resetting it were unsuccessful. By this time, his aircraft had settled to an altitude of 50 feet above the ground. He retarded the right throttle once again and by carefully advancing it was able to coax 83 percent power from that engine without the accompanying surges. Resisting the urge to pull the nose up, Captain Williams played his pitch attitude to maintain 160-165 KIAS. Once achieving 83 percent on the right engine, he was able to level the aircraft by reference to the heads up display and accelerate to 170-175 KIAS. He then initiated a slight climb and a right turn to downwind. After locating a clear area, he jettisoned the centerline fuel tank. The right engine again began surging and was cleared by cycling the right throttle. The reduction in weight enabled Captain Williams to accelerate to 190 KIAS and climb still farther to 200 feet AGL where he initiated fuel dump procedures. As he turned to final approach, Captain Williams lowered his landing gear and terminated fuel dump procedures. His landing was uneventful. The superior airmanship, prompt reaction to a critical emergency, and professional competence demonstrated by Captain Williams resulted in the saving of a valuable aircraft and averted possible injury or loss of life. WELL DONE! ■

A LIFE SCIENCES SPECIAL REPORT

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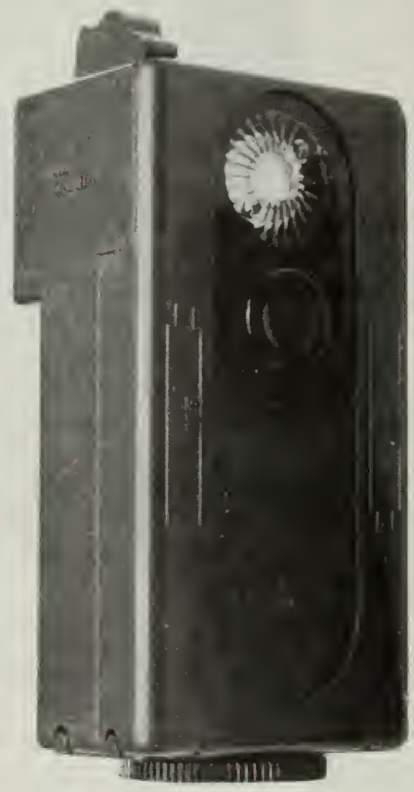
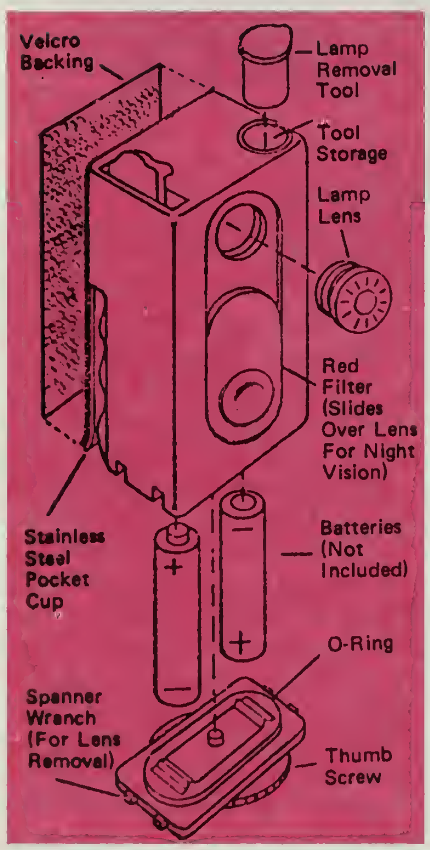


CREW LIGHT



Announcing the light designed especially for aircrew membe

If you're a USAF flight crew member that is really in the dark, here's a super little item that will easily brighten your entire outlook. It's the NEW personal crew light now available through the Federal Supply Catalog. It won't light up the whole world, but it's a handy dandy in a confined cockpit. It will fit into the palm of your hand and has a Velcro backed steel pocket clip for convenient portability.

To highlight some of the outstanding features of this truly utilitarian crew light we'd like to spotlight some of these shining points:

Velcro backing strip for ment to crew member's ch hands-free operation.

■ Stainless steel clip fa for attaching to pocket.

■ Light weight conveni 4.6 oz (130 grams) includi teries)

■ Compact size ($3\frac{5}{8}$ x $1\frac{5}{16}$) for easy handling an age.

■ Sliding red filter for r nance of night vision.

■ Waterproof.

THIS PRODUCT HAS THE OFFICIAL USAF LIFE SCIENCES SEAL OF APPROVAL

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AIR FORCE PROCUREMENT SYSTE

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AEROSPACE

ETY • MAGAZINE FOR AIRCREWS

AUGUST 1979

LOW ALTITUDE MISHAPS
How Not to Hit the Ground

BLUE FOUR NEWSLETTER
Who's Flying the Airplane?

DOING WHAT COMES NATURALLY

Low Altitude Mishaps

or how not to hit the ground

MAJOR TERRELL J. OSBORN
Directorate of Aerospace Safety

A COLD GRAY DAY

■ You are a new guy in your tactical outfit and are excited about the unit mission. You look forward to "hedge-hopping" and "hassling" in the 300-100 feet AGL block. It's going to be a challenging job, but you know you are up to it. After all, you have almost 200 hours in the bird.

In your first two months in this outfit you fly regularly with your supervisors, who give you some constructive criticism. Overall, you are doing quite well. You have been stepped down to the 300-100 feet AGL block and are now preparing to go to the tactical range to practice for the high-threat war. You are still Blue 2, but that's all right, since the tactics allow each member to do individual maneuvering.

A light snowfall has covered the ground, and the trees are barren. The day is also overcast and a little hazy. But you can still see the targets OK. Besides, you learned the tactical attack business out on the desert where the terrain features were also nondescript. You will just be a little more alert than usual.

That first attack went really well. You are hot today. Now, to give those bad guys a couple of strong jinks and get it back on the deck to set up for the next pass. Lead is "in" now, so you start a firm left turn and see how he does. Bet you can get a better bomb than his. You still have plenty of altitude, at least 300 feet, and will not descend any more. That will keep you above those little hills and hard-to-see trees while looking back, or so you think. You know, maybe you should check the ground out front. Oh, s—!

LOW ALTITUDE, HIGH RISK

At the midpoint in 1979 it becomes clear that low-altitude operations are continuing to take a tremendous toll in aircraft and lives. The Class A and Class B mishaps which included low altitude as a factor (and not including takeoff, approach, landing) are occurring at a ra considerably worse than in 1 Fatality rates are also up alarmingly, due in part to the increase in low-altitude mish

Approximately half of the aircraft that hit the ground or trees do so on low-level navigation/tactics missions. (These do not involve bombi cargo dropping, or aerial con but just getting from point A point B with minimum exposu Some of these aircraft are al others are in formation. But i last 18 months, almost two d aircraft have contacted the te while on navigation missions

It is not surprising that the majority of these Class A and Class B mishaps involved fig attack, or recce aircraft. Wha surprising is that one T-38, tw O-2s, two OV-10s, one HH-3 one C-130 crashed during lo

le operations in 1978, and 979 statistics include a oyed C-12 and a Class A mishap.

sions other than navigation also been involved in these ltitude mishaps. Six red during gunnery range ies. These weren't sing" or "target fixation" , but occurred while on wind, downwind, approach pop-up point, etc. One of was a midair collision en flight members who see each other.

ee more of the low-altitude ps occurred during air at/intercept operations. three mishaps weren't G or control losses, but the t were simply flown into a sing situation where the an out of altitude and ideas.

ne of the low-altitude ps could have been nted very easily. In these , the crews were not overtasked, undertrained, or inattentive. They were simply faced with inadequate weather for the route and, due to complacency or excessive motivation, chose to attempt to fly VFR in IMC. One such pilot had twice previously been directed by supervisors to discontinue a low level due to weather. He just did not get the message.

AFR 60-16 is clear in its intent. The idea is to alter course to remain VMC. Obviously, the smart move is to do this soon enough that you are not caught making an unplanned turn in IMC.

If you do not abort the route until already in the weather, it is too late to apply AFR 60-16. Now it is time for emergency procedures; get above the rocks ASAP and obtain an IFR clearance. The speed of an RF-4C, and human reaction times, just will not allow for dodging mountains when the visibility is down to 1 mile.

The 1978-1979 review shows some other interesting facts. In three of the low-altitude mishaps, a breakdown of crew coordination was a factor. These were cases where a second crew member should have prevented the mishap but did not do his job. In another three mishaps, the pilot could have missed the ground by pulling harder on the pole, but he did not. In a total of 11 mishaps, including the "VFR in IMC" losses, willful violations of directives and sound judgment were factors. Some examples were intentional violations of minimum altitudes, flying too slow, knowingly attempting to exceed aircraft performance limitations, buzzing, showing off, and not wearing required eye glasses.

Poor basic stick and rudder techniques (loss of control) were factors in nine of the mishaps, inadequate training for the low-altitude environment was a factor in another three, and two could have been prevented by an IP who was along for the ride but was not doing his duty.

TO ERR IS HUMAN

The last, and toughest area to analyze is that of human factors. A glance at the following table will show the more common physiological factors and their impacts.

Factor	No. Of Occurrences
Visual Illusion	10
Channelized Attention	11
Inattention/Distraction	12
Spatial Disorientation	2
Loss of Situational Awareness	10
Overconfidence	3
Excessive Motivation to Succeed	6
Task Oversaturation	4

Most of these factors are insidious. The pilot thinks all is well and never knows what hits him (or, more accurately, what he hits). Even "old heads" are not immune to these complications.

In most cases, two or more human factors are involved, much as they were involved in the fictitious example that started this article. All crew members and operations supervisors should be sensitive to the fact that highly demanding missions, environments with low contrast, low recent (or total) experience, and personal stress have additive effects. The inclusion of one extra task may be all it takes to "shift a man's brain into neutral," with a "smoking hole" shortly to follow.

Visual illusions occur in many different environments. Some examples are smooth water, flat snow-covered areas, smooth desert terrain, hills covered with barren trees, and green hills that blend with other green hills. The danger of illusion is worth considering on virtually every low-altitude mission.

Channelized attention is another of the insidious human factors. Examples are fixating on another aircraft during a low-altitude rejoin, target fixation, watching another aircraft during

air combat tactics or low-altitude formation flying, and watching something on the ground such as a smoke mark. The need for a crosscheck in the low-altitude environment is as critical as it is on a GCA. Only, in this case, the very important items to crosscheck are the ground, the aircraft attitude, and the flight path. This calls for self discipline and a keen appreciation of how quickly things can go wrong at low altitude.

Inattention and distraction are not the same thing, but both result in a lack of attention to ground clearance. These human factors differ from channelized attention, in that attention is focused on things other than aircraft control and maneuvering. Attention may be drawn to a cockpit warning light, ground features, switches, threat warnings, or emergency actions.

Even more subtle are personal problems which may cause a pilot's mind to wander just when the mission demands full attention. It is a paradox that a person's attention will shift when the mission seems the busiest. But it happens, and the more stressed a person is, the more probable is this preoccupation. Fitness to fly means physically and psychologically. All people have occasional poor days psychologically, and on these days, they are more likely to have accidents.

Spatial disorientation is usually a factor whenever the horizon is indefinite and the visibility is somewhat reduced. A likely situation is air combat tactics over water. It is tough for a pilot to take his eyes off of the flight to check his attitude, but some situations make it necessary. Loss of situational awareness generally means a loss of altitude awareness, and it is frequently related to other human factors such as channelized attention or disorientation. The pilot is generally maneuvering the aircraft aggressively and concentrating on something outside his aircraft. He has no idea he is getting dangerously low, until it is too late.

Call it complacency, ego, or whatever; overconfidence is a feeling that you are in control and nothing can go wrong; then something goes wrong. Unfortunately, a lack of prudence frequently accompanies overconfidence, This immature type of personality is frequently well known to his squadron mates and supervisors. It is a shame when someone, anyone, doesn't talk caution to this man before he "lets it all hang out" once too often.

Closely akin to overconfidence is an excessive motivation to succeed. Obviously, this is a valuable character trait when properly contained. But it is easy to let the realism and excitement of the current tactical scenarios affect judgment. Here again, supervisors can play a key role in containing aggressive young crew members and making sure they know this can be a deadly business.

The busy mission is a fact of life these days. It is tempting to add one more task that saturates a crew member, causing performance to begin to suffer. Key areas to beware of are the first few rides in a new mission phase, the addition of new tactics or threats, and the sudden addition of unexpected weather or an emergency. But task saturation can happen to anyone on any mission. Every person has a limit to how much he can one time, and some people higher performers than othe key responsibility of each supervisor is to know the li his aircrews, and to be sure can do the mission before clearing them to fly. No supervisor should ignore th responsibility to his people.

This discussion has not included the numerous crew members who made mistak serious as those highlighted were lucky enough to surviv return home with only Class damage to their aircraft. Sin January 1978, five fixed wir six rotary wing aircraft have hills, trees, wire, water, etc., returned home with relativel damage. (The same could n said for the self-esteem of e crew member.) Since most cannot depend on being abl hit the ground and live, we r try harder to fly above the obstacles. Knowing our own limitations is a good place to the tough task of staying aliv

The inescapable fact is th today's tactical mission is to It is busy and dangerous. Ar error that might be minor at 10,000 feet can be deadly at feet. The smart operator kno when things are not going qu right and backs off on the mi intensity or raises his altitude little. The others press on un they end up in a hole. The h of embarrassment is to die fo good reason. A training loss this category. ■

ABOUT THE AUTHOR

Major Osborn is an action officer Flight Safety Division, Directorate of space Safety, specializing in writing of final evaluation of USAF flight m Major Osborn is a senior pilot with a imately 3,100 hours F-4C/D aircra spent 10 years as an instructor pilot, ing 2 years as a flight examiner. I served most recently as chief of flight and later as chief of safety, Luke AFI

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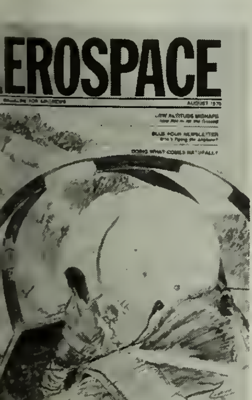

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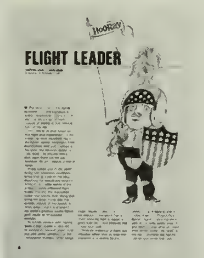

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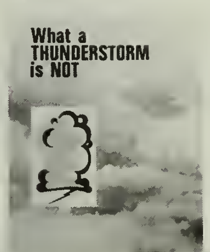


SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

So you're going to be a FLIGHT LEADER

CAPTAIN GARY L. SHOLDERS
Directorate of Aerospace Safety

■ For most of us in the fighter business, our first exposure to military leadership occurs on the day that we are out in front instead of staring at that infernal light on the star.

Very few of us ever forget our first flight lead experience; for me it was the most important day in my fighter career. Overnight, I felt transformed from just a wingie to the boss, the decision maker, an "old head." As anyone who's ever been there will tell you, however, life ain't always a bed of roses.

Every fighter jock in the world today can remember countless times that he's sat on the wing mouthing his individually tailored string of four-letter words at the antics of some unnamed flight leader. For me, the realization came very quickly that, along with being the boss, I was also the cussee instead of the cussor. In short order I found that even I, the world's greatest young fighter pilot, made an occasional mistake.

In a more serious vein, having been a flight leader in and out of combat for several years, I can say with some authority that the "occasional mistake" often brings tragic results. There is no experience in the world that is more sobering than to watch a good man die — and knowing that it was your fault.

Dramatic evidence of flight lead mistakes which cost us lives and airplanes is available for the asking — you'll have to look n further than the "Project Red Baron" report in your squadro safe or the wing safety shop. you don't believe what you re then corner some "old head" the bar — chances are that he can tell you some true "war

es" which will curl your hair.
point of the above discussion
nply to reiterate one more
that fighter flying simply will
olerate poor flight leadership.
now we get to the point of
article: How do you, the
d's greatest young fighter
prepare yourself for the
leader role? There are
ral things that you can do
to your first experience out
nt that will make you better
oped to do the job. True, you
till make mistakes, but if you
are yourself well, your
akes at worst will result in
arrassment instead of a
king hole somewhere.
entally, even if you're a new
n RTU or an old head, the
ghts outlined below have all
from "the school of hard
ks." Read on — they may
to you.

EADERSHIP: This word is
to any aspiring flight leader.
will not be a flight *manager*
flight *director*; you will be a
leader. The basic tenets of
leadership apply in spades
it comes to herding your
le around in a proper military
ner. We've all heard about
over-and-over again — let's
e some leadership points as
apply to the flight situation.

Set the example: In fighter
language, get your "stuff"
her. There is no room in the
lead business for some yo-
ho isn't an expert in his unit
on and the particular tactics associated with his weapons system. In order to gain/maintain control over a group of potentially unruly fighter jocks, you *must* have the credibility that inspires your wingman to listen when you speak. Without credibility, your wingie will subconsciously (and sometimes consciously) reject or question your briefed procedure or tactic. He may not say anything during a flight brief, but rest assured he will tend to go his own way when the going gets rough. The quickest way to lose control of a flight is to display your ignorance to its members. Be honest with yourself; ask the question: "Am I credible enough to do the job?" If the answer is no, you have no business at the front end of a flight.

2. Have integrity: Although integrity is an overused word in our Air Force, it is nevertheless vital to the safe and professional conduct of your flights. The perfect job of leading has never been accomplished; a good flight leader, recognizing this, will admit his mistakes to his flight members and honestly invite them to critique his performance. He will reflect for a moment after every flight and try to dream up ways to make himself better the next time. With honest self-criticism, you will avoid the trap of becoming an insufferable know-it-all who inspires no one but himself.

3. Accept the responsibility: If there is one bottom line in the fighter leadership game, it has to be: "The buck stops here" to quote the late President Truman, a fighter pilot if there ever was one. In today's Air Force, it's easy to blame oversupervision or too many regulations for everything that goes wrong.

Recent history is replete with guys who lost one or more wingmen in combat through no fault of their own. I have personally listened to the rationalizations of several folks who have deluded themselves that the SAM that hit number 2 in the cockpit "came out of nowhere." In fact, the missile came out of a cloud deck 500 feet below the flight or snuck up unseen at 6 o'clock.

The point of this discussion is that as a flight leader, YOU ARE THE BOSS; the safe conduct of your flight is your responsibility — period.

Fighters do not fly and fight on the strength of a book of regulations or a bunch of generals in their offices. Fighters fly and fight because of a group of motivated folks led by a motivated leader who is credible, mature, and willing to accept the consequences of his actions. Regulations and generals can (and will) provide pertinent guidance but it will always be up to you, the flight leader, to provide a proper decision in a sticky situation.

PREPARATION: Most of us have been "inspired to greatness" several times by flight

leaders who walk in 5 minutes after scheduled brief time and proceed to ask everybody in sight what the mission is. If there is one way for an otherwise credible leader to screw up a flight, this is it. It really doesn't matter how many times you've led the same mission, preparation is always required if you plan to do the job right.

In the first place, even though it may be a repeat of yesterday's mission, the players will invariably be different. A little investigation into the training progress and capabilities of each flight member is essential if you are to lead an effective flight. Individuals do vary, in spite of our standardization efforts. The flight leader who doesn't think about tailoring each mission to the requirements of the flight members may just run one of his universally-assignable wingies into the dirt.

In the same vein, a good flight leader needs to look at each mission and set attainable goals for each flight based upon all of the pertinent factors. He needs to consider the players, the weather, the airspace, etc., and devise a mission scenario which will accomplish the desired goals. For example, I have personally been involved many times with basic mudbeater F-4 types who set impossible air-to-air training goals and then fail to meet them.

I have seen flight leaders with their hair on fire briefing incredibly complicated air-to-air scenarios; during the engagement, the entire flight races around at a thousand miles an hour and gets shot six times without even knowing it. The conclusion to this gaggle is invariably a giant bomb burst of F-4s bailing out of the fight in four different directions — screaming for help all the way.

The flight leader in the above example could have gained a lot more training for his JP-4 if he had stuck to a more basic scenario which his flight could handle. The key to success is simple: Prepare yourself to lead each flight so that you will gain the maximum from your mission without overloading your flight.

MISSION ORIENTATION: Well, we've solved the leadership and the preparation problem; we should be ready to climb into our all-metal/composite material jets as good, solid flight leaders. Not quite guys — we've got one more thing to think about. The fact is that the basic mission which we are tasked to perform is still there.

Sometimes the job of a fighter squadron tends to become a bit obscured to the guys in the trenches. Many of our younger jocks perceive that their only responsibility is to say "two" and obey all the regulations. Their real job is hard to see amid all the gobble-de-gook and officialese of the everyday Air Force.

As a flight leader, you are the first and most important link in the leadership chain that can he clear the air for your wingme You have a golden opportun orient yourself and the flight you lead toward your outfit's mission in life. A mission-ori flight every time that you suc that gear handle will add pur and motivation to every hour you spend on your job. Belie me, guys, that motivation am the troops is precious. Motiv sparks interest, interest spar harder study, and harder stu builds credibility. The net res a motivated bunch of fighter is a more effective flying operation. In short, as a new flight leader, you owe it to yourself and your organizatio develop a keen sense of mis Remember that from now on what you say and do affects others as well as yourself.

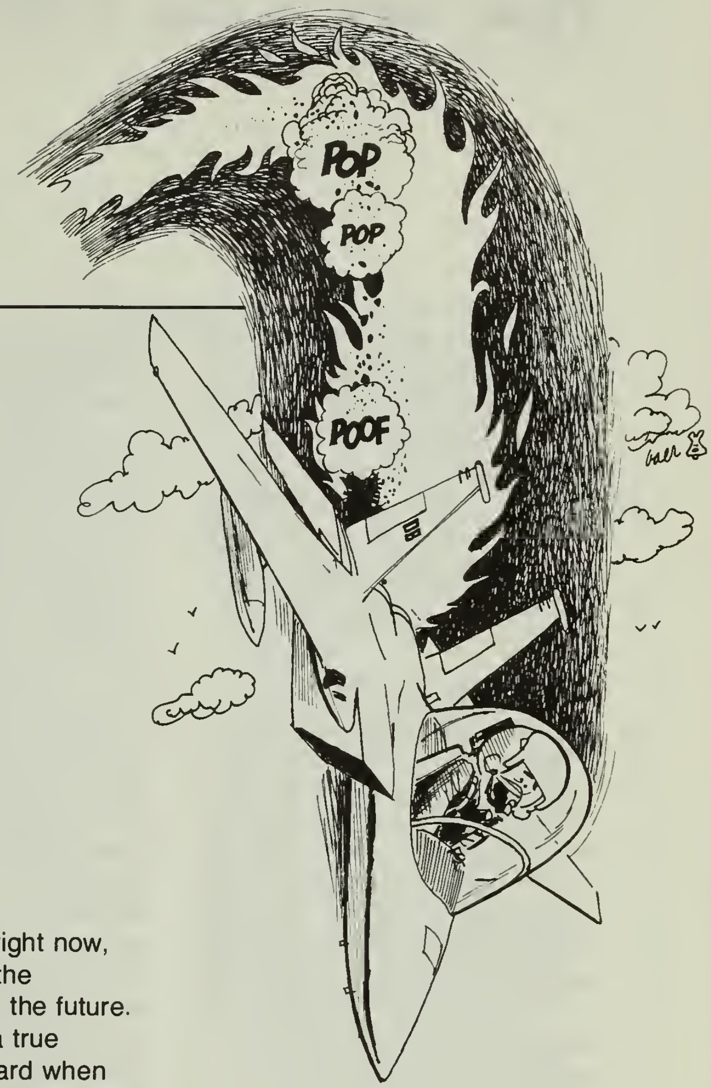
Now let me answer the question that must have popp into your heads by now: "Wh this article doing in *Aerospac Safety?*" Simple. Imagine you as a flight leader filling all of t squares that this article has b talking about. Do you think fo minute that any of your wingie will end up as a smoking hole the ground because of your carelessness? I don't. ■

ABOUT THE AUTHOR

Captain Sholders is the F-15 action c in the Directorate of Aerospace S He has flown the F-100 and F-4 ai and served a combat tour with the 55 Udorn, Thailand. His other assignn include Instructor pilot at George and Zaragoza AB, Spain.

R WILLIAM C. MORRISON
orate of Aerospace Safety

low safe s the ℾ100 ENGINE?



; the prime motivator for the and F-16 aircraft, the Pratt & ney F100 engine has been ubject of considerable ion. The engine has shown a bing tendency to stall and/or ate at exactly the wrong time ight in the middle of a fight) as even asserted itself by g apart once in a while. ese characteristics have ked raging arguments; on and, we have fighter pilots, people, and assorted other who feel that the record of iece of machinery just isn't enough. On the other hand ve fighter pilots, safety e, and assorted other folks oint out the fact that the engine has an excellent record compared with some engines.

his article, we will try to e some of these emotional rsts and talk about some of the programs in being right now, which should increase the reliability of the F100 in the future.

The F100 engine is a true technological leap forward when compared to engines of the past; its thrust to weight ratio is twice as high as the J75. The engine required about four times as much design engineering as the TF30 engine, which is its closest rival in performance. Experience with vintage engines such as the J57 and J75, as well as recent experience with fan engines like the TF30, was used in the design of the F100. In short, the F100 engine represents nearly the sum total of our engine technology.

Unfortunately, all of this wonderful technology did not result in a 100 percent trouble-free engine. We have experienced failures and engine anomalies. The primary concerns to the F100 user today are turbine failures and stall/stagnations. There are several ongoing efforts to eliminate these problems as well as to identify and solve potential problems before they happen.

One of the major tools that has been used to define problem areas is called accelerated mission testing (AMT). The F100 is the first engine to be subjected to AMT this early in its life cycle. Basically, AMT consists of a statistically derived pattern of starts, stops, cruises, snap accelerations, and augmentor lightoffs which are performed on a test cell. By eliminating

How safe is the F100 ENGINE? continued

nondamaging portions of the flight envelope such as idle and extensive steady-state cruise, an engine undergoing AMT can accrue wear at an accelerated rate of 2 or 3 to 1 compared to an installed engine. By running a test cell day and night, failure modes can be identified and corrected years before they will appear in the field.

AMT is not a panacea for identifying potential problems, however. An AMT engine cannot be subjected to the day-to-day rigors of field usage like G forces and altitude changes; in addition, AMT is a very poor measurement of wear on items like pumps and gearboxes which are not normally affected by the accelerated profile.

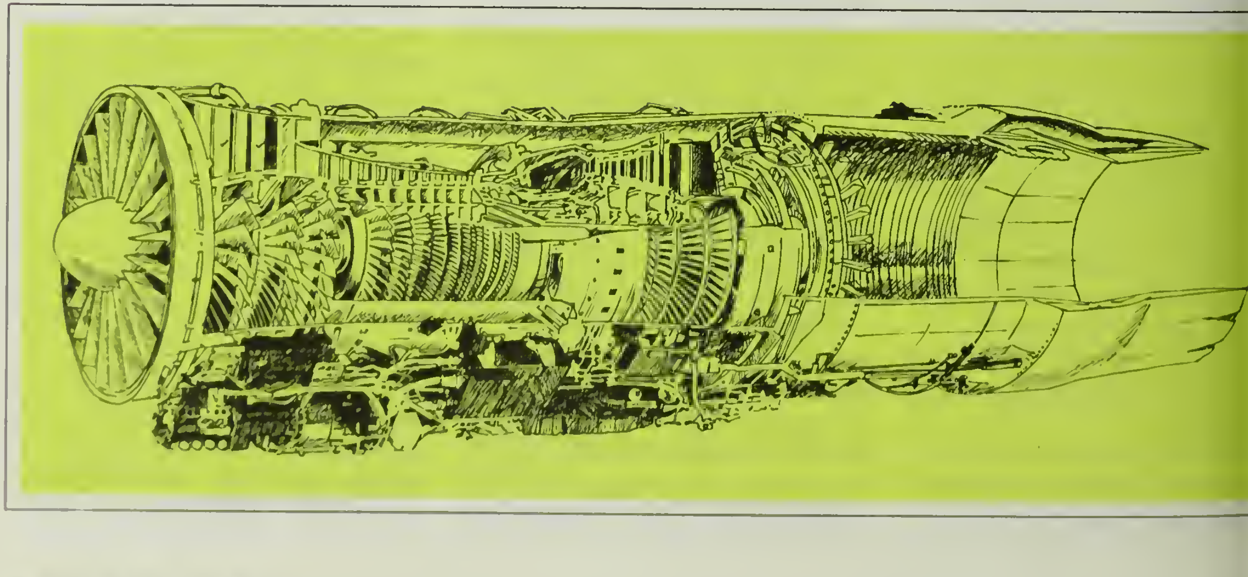
To supplement the AMT analysis, the Pacer Century program was devised. This program has deliberately accelerated field usage of selected engines so that they "lead-the-force" in total time. Pacer Century engines receive very detailed teardown inspections on a regular basis; findings are closely correlated with AMT results to provide a more realistic look at potential problem areas.

Experience has also been used to evaluate F100 engine problems. About a year ago, the Chief of Staff directed a reevaluation of the F100's structural integrity in view of the history of failures in the earlier TF30 engine. This evaluation is known as the Structural Durability and Damage Tolerance Assessment (SDADTA). To date, the team has looked at failures of other engines and selected areas within the F100 for detailed analysis. Seventy-seven components are being scrutinized, using analytical tools that were not available when the engine was designed. The goal of the tea to reevaluate and determine i redesign or early retirement o these components is required

The net result of the above testing and analysis programs that potential failures will have been pinpointed and fixes incorporated before the engin break in the field. We still hav field failures; the fact is that n amount of AMT/Pacer Centur type analysis can duplicate fie experience. Because of these programs, however, you, the p have been spared a lot of ver real heartburn.

Unfortunately, when you've heartburn today, it doesn't do

F100 is most advanced jet engine in USAF inventory, powering F-15 and F-16 fighters. Engine has presented problems but improvements and learning are improving performance.



h good to assure you that you 't have it next week, nor does ck the program to say "Cheer nate, it could have been a ding ulcer." Let's talk now ut some of the actions taking e today to solve existing lems with the F100 engine.

rst, let's look at turbine res. In fighter pilot language, s when the engine blows up. ine failures are a result of erature distress in the hot on of the engine, which es turbine blades to break off. etected malfunctions normally he cause of these problems; xample, thermocouples ing the wrong temperature, ‹ fuel nozzles creating a hot ak which literally melts away al turbine vanes, combustion s with undetected cracks. se malfunctions result in etected overtemperatures h rob the life of the turbine es.

eps are being taken inuously to eliminate the bad rs that are causing the lems. Technical data have revised for periodic tance checks of mocouples; filters have been ed to fuel nozzles to keep is from sticking a nozzle , and aural tone warning for ne overtemperature will soon etrofitted to the fleet. In tion, a new flexible borescope ection device has been loped which allows inspection econd stage turbine blades vanes while the engine is lled in the aircraft. The flexible borescope will be in the field in the summer of 1979; installed engines will undergo periodic inspeciton. With the above measures and others like them, the rate of F100 turbine failures is declining.

F100 engine stagnations have been a constant area of concern. Several hardware fixes are being developed to reduce the stagnation rate. All of these hardware changes are designed to smooth out pressure "spikes" within the engine (normally associated with augmentor selection) that cause a stall and subsequent stagnation. Engine trim and troubleshooting procedures are constantly being reviewed and changed as necessary to better ensure that your engine(s) are in peak condition. The result of the measures taken has been a steadily declining stagnation rate over the life of the system.

There are several things that you can do to prevent stagnations. First is to recognize that the F100 engine is, by design, operating on a slim stall margin. Any action on the part of the pilot that tends to create the pressure spikes we were talking about increases the probability of stall and/or stagnation. The effect of pressure spikes is greatest in the upper left-hand corner of the engine envelope, i.e., high altitude and slow airspeed. Examples of stall inducing actions in the upper left-hand corner include augmentor selection/deselection, rapid throttle movements, high AOA onset rates, and aircraft yaw. The engine may perceive any of the above actions as socially unacceptable behavior on your part and give up the ghost.

It is also important to recognize that the engine envelope in the Dash One is not necessarily the true envelope for a particular engine. The depicted envelope was based upon very early flight tests, and does not necessarily show accurately the effects of AOA, yaw, or rapid throttle movement. Also, the engine envelope is definitely affected by such things as engine trim and turbine blade wear. The point is, particularly when you are operating in the upper left-hand corner, that by treating the F100 with a little TLC, you will decrease your chance of a stall/stagnation.

The development and safety community will continue its efforts to prevent engine failures and stagnations through improved hardware and ongoing test programs. These efforts, along with your cooperation, should eventually reduce occurrences to a minimal level.

The bottom line is that we have the best engine technology can currently provide and one which will continue to improve as we gain experience. ■

Doing what come[s] naturally

MAJOR STAN SANTILLI
Human Factors Investigator
Biodynamics Branch
Brooks AFB, TX

■ There is a movement underway (again) to tackle that elusive problem that has plagued aviation safety ever since Icarus flew too close to the sun and melted the wax on his wings. That elusive problem is the "pilot error" mishap. There have been continuing attempts in the past to get to the root of this problem but despite these attempts, "pilot error" consistently is indicated in over half of the Class "A" mishaps annually.

We have standardized, tested, briefed, regulated, and rebriefed crew members, all aimed at reducing "pilot error" mishaps and all to little avail. Perhaps our apparent inability to come to grips with this problem stems from a basic misunderstanding of its real source — normal human limitations. Such a misunderstanding could easily explain the relatively ineffectual remedial measures noted above, as well as the persistence in using the term "pilot error." This term is overused, misused, and fails on at least two counts in describing the cause of aircraft mishaps.

First, it points the finger at the pilot when, in fact, operator induced mishaps invariably consist of a long line of human errors, only the last of which was committed by the pilot. Secondly, the term "error" suggests that the pilot failed to perform to his capability or potential through some oversight or mistake on his part.

It is often true that the pilot fails to perform as expected; however, this cannot always be construed as an error on his part. More often than not, he has performed to his human design limitations, in which case we might attribute cause for the mishap to the designer. Or more realistically, we might attribute the cause of this type of mishap to our failure to recognize, anticipate and take into account these limitations. After all, we've at least notionally been aware of them for over a century. Let's take a look at these design deficiencies and see how they can limit our ability to perform to our full potential.

Man is, at his best, an imperfect processor of information. We learn about and attempt to modify the environment around us by means of a process which entails receiving stimuli, deciding what they mean and what to do about them, and then making a response. This response changes the environment; we perceive this change, and the process starts again. In the course of a mission, we make thousands of these mini-decisions which take seconds or less and a few larger ones

may take minutes, if, in fact, ision is made at all. Each of this process though is d in efficiency by built-in ts.

he perception phase, we rely r senses to provide us with ate information on what's ening around us. This nation isn't always reliable h. Each sense operates generally prescribed holds. If the stimulus is le these thresholds, we won't t it. If it's too intense, it can tracting if not painful. ermore, there are many i coming in at the same time several senses and the pilot determine which one or nation is giving him the most e or most important nation.

complicate matters, each of senses can be easily fooled, ding on how the stimuli are nted. We call these illusions, the more common in flying disturbance of the vestibular atus which can lead to l disorientation. To further icate matters, fatigue and utrition can narrow these olds and emotional stress sult in selectively perceiving muli we want to, or ting" stimuli that aren't even

whole area of sensation erception is critical to this ss, especially when you er that we put a guy at 100′ oing 450 kts indicated, ask jink, maneuver, arm and eapons systems and still avoid driving his aerospace vehicle into the ground. That can be asking a lot.

The second phase of this process, that of processing and deciding what to do with this information, essentially consists of recognizing the stimuli, sorting them out, categorizing them and deciding what action to take, if any action is warranted.

We are all limited in this phase also, some more than others. Nevertheless, no one performs to the ideal potential. We have varying capacities for short- and long term recall; we have different levels of cognitive skill which limits our ability to categorize, abstract, and apply logic; some learn faster or better than others; some can concentrate for only several seconds, some for several minutes, and some can divide their attention between several tasks; some cannot. Furthermore, motivation and emotional stress can redirect or modify this phase so that the whole process is slowed down, sped up, or prevented altogether.

The last phase of this process, that of responding, is also inherently limited. We all have less than perfect basic motor skill abilities, and different individual requirements to practice those skills to keep them sharp. We are also limited by our physical capacity to respond. The human body is capable of only so much in terms of strength and endurance. Furthermore, it doesn't perform as well if it isn't well nourished and rested.

Finally, from both the physiological and psychological point of view, the glandular secretions accompanying emotional stress can, in and of themselves, determine a pilot's response.

This is to say that the results of these normal, built-in human design deficiencies are not errors; they are not even deficiencies, unless a pilot is thought of as a computer driven machine. They are basic human characteristics which must be recognized, anticipated, and compensated for when we design weapon systems and the tactics to employ them.

Making the environment more compatible with human limitations is only part of the solution. The real hope in mishap prevention lies in increasing the pilot's capacity to more effectively use the process described above in coping with environmental demands.

"Task saturation," "channelized attention," "distraction," "situational awareness," and "decision delay" are just labels for some of the failure modes in the process described. To increase the effectiveness of this process in pilots goes to the heart of the problem. We have the technology which permits us to understand the process. What we need is the methodology to implement meaningful programs and the perseverance to carry them through. This is hard, and the Air Force has been trying for some time to cope with the problem piecemeal with occasional success. If recent accident history tells us nothing else, however, it is crying out that the piecemeal approach is no longer sufficient.

We must look at man's involvement as a system and improve the system to optimize the ability of man to perform in the totality of the various subelements and tasks. Basically, that requires concurrent improvements in selection, initial training, aircrew utilization, human engineering, transition and continuation training, aircrew management, tactics development and even mishap investigation and analysis. It's going to be both hard and expensive, but as I see it, there's no other way. ■

THE PROFESSIONAL APPROACH

Air Force Communications Service
Scott AFB, IL

■ "OK—let's wrap up this paperwork and get this show on the road. Flight plan ready? Check. Weather? Check. Weight & Balance? Check. NOTAMs? Check. Great, let's file and get going!"

An everyday occurrence around the world—just routine. We do it all the time—or do we? Flight plan, weather, weight & balance—all of that goes down on paper in black and white. Even NOTAMs get a check (√) on the DD Form 175. But do YOU really check NOTAMs properly and completely? What do YOU look for?

If you'd like to be sure you're looking for the right things, then read on. A little more knowledge of what the NOTAM system is all about will either confirm that you're on the right track, or give you the information you need to get you there. Either way, you win—so read on.

The heart of our NOTAM system is the Air Force Central NOTAM Facility (AFCNF) located at Carswell AFB, Texas. The AFCNF's responsibility is to provide current safety of flight NOTAM data for all Department of Defense (DOD) airfields of interest, worldwide. To effectively accomplish this task, data is exchanged daily with over 125 international NOTAM offices, 15 foreign military NOTAM offices, and over 300 DOD collection agencies and facilities. The personnel at the AFCNF handle over 60,000 messages each month. They translate, edit, compile and disseminate this information using several types of communications media. The Automated Weather Network provides NOTAM data directly to the flight planning environment, and is responsible for the majority of NOTAM traffic dissemination. Other media used include the Automatic Digital Network, the Aeronoautical Fixed Telecommunications Network, and the North American NOTAM Exchange Circuit. all serve to transmit two basic NOTAM produ the daily summary and the hourly update.

The NOTAM summary is a cumulative listi NOTAMs by state or country. Additionally, it inc a category of NOTAMs called Special Notices, contain information covering such a broad are it cannot be identified with any particular ba possibly any one state. The summary is com and published every 24 hours in the case of the American and European summaries, and eve hours for Central and South America and the P summaries. During low volume periods (usuall urdays) the summary life may be extended for 48 or 72 hours.

The hourly update is a cumulative listing of all revised, and cancelled NOTAMs and Sp Notices received at the AFCNF during the last or since the last summary was published. This mation is published each hour, and keeps the mary current.

What should you look for when you chec NOTAMs? First, check to see that the summary y looking at is current. The summary number and times are printed on the first page of each co For example: NANSUM NR 2005 VALID FR 20 THRU 221729 MAY. This is the North Ame Summary number 2005; it is valid from 1730Z c May thru 1729Z on 22 May (this is a weekend mary, hence a 48-hour valid time). Next, look a special notices for anything which will affect flight. Then look in the geographical listings NOTAMs at least for your departure, destina and alternate airfields. (Absence of a listing m there are no NOTAMs for that base.) An addit examination of enroute facilities you intend to u also recommended.

Now you must repeat the entire process wit hourly update. Check that the update identifies correct summary number and that the valid tim the update has not expired. Remember—if you to include the update in your review of NOTAM YOU HAVE NOT CHECKED THE NOTAMS!! NOTAM on the summary may be cancelled or alt

he update, and new NOTAMs may be entered e update. Therefore, neither the NOTAM display he information which you obtained from a sum- / can be considered current without a valid ly update!

ccasionally, a portion of a summary or update be missing or garbled in transmission. If it is of the summary, then only that particular column e removed from the display board. If the update ssing or garbled, the entire summary and update be withheld from the display until a corrected can be transmitted. During the intervening time, rcrews must contact the Base Ops dispatcher ssistance in obtaining NOTAMs.

r NOTAM system—in particular the Air Force ral NOTAM Facility—has a tremendous job to rm. It's a continuous process, 24 hours a day, 's a week. The present system is limited by slow d communications equipment and the tedious ual processing of all information. The future, ver, holds some definite improvements which being developed. An Automation Enhancement am will eliminate much of the manual processing ntly employed by the AFCNF and will result in e current summary and hourly update product. expected to be installed in January 1982. Addi- ly, a request for Base Operation terminals to direct access to the AFCNF NOTAM data base ing processed. The combination of these two isitions will bring about a vastly improved M Automatic Response to Query system which rovide both real time information and person- l printed copies of NOTAMs for the aircrew. On orizon, we see airborne terminals able to query me NOTAM data while enroute.

hang in there with us—better NOTAM service the making. Until then, be sure you use the nt system properly. At the very least, it can you a little embarrassment. On the other hand, per use of it could ruin your whole day. Why a chance? Use the Professional Approach— K THE NOTAMs! ■

Letter To REX

■ Three cheers for the Rex Riley Program! Lajes has always been proud of our status as a recipient of the "Rex Riley Outstanding Transient Base Award" and we are always looking for ways to improve our facilities and service for transient crews. Your many recent Rex Riley articles have given us some good ideas to improve our services.

We feel that our base exceeds the Rex Riley standards and deserves to retain our award. Over 75% of all crews transiting Lajes have rated us as outstanding. We have included numerous examples of recent aircrew comments to aid in your evaluation of Lajes. In addition, we have some programs and ideas that we want to pass along to you.

Although we feel that our base continues to be outstanding, we are always looking for areas to improve. Lajes has initiated the following programs to improve our service to transient aircrews:

- Rex Riley Committee. The Rex Riley committee (chaired by the DO) was formed in order to evaluate our entire base program for handling transient aircrews. The committee meets each quarter and consists of representatives from the DO, Communications, Air Traffic Control, Weather, Base Operations, Supply, Maintenance, Transportation, Services, MWR, Safety, MAC Command Post, Billeting and the BX. We discuss the results of transient aircrew questionnaires (both laudatory and negative points), self-inspections, recent Rex Riley articles, and areas for improvement.
- Transient Aircrew Questionnaires. These short questionnaires are given to aircrews and provide feedback on our facilities and services.
- Local "crewmember self-inspection exercises." We found it useful to have one of our base personnel simulate an aircrew member who stays with a RON aircrew from block in to block out. Feedback from these "self-inspection exercises" is given at Rex Riley meetings.
- "One Stop Service." Base Operations, Command Post and Weather are co-located so that an aircrew can rapidly flight plan and outbrief. In addition, because many of the routes from Lajes to the CONUS or Europe are identical, we have made reprinted flight plans available to crews that fly these standard routes.

Col Kenneth S. Landon
1605 ABW/CV
Lajes Field, Azores
■

4 BLUE NEWSLETTER

Who's Flying The Airplane?

■ We have a good many mishaps each year with factors that are not directly controllable by the crews who end up in the mishap; we also have a good many more that they can control. In fact, these are preventible only by those who are flying the aircraft. Collisions with the ground where our investigators can find nothing wrong with the machine that would account for the mishap fall into the direct control category.

In the past 2½ years we have suffered 36 destroyed aircraft and 77 fatalities, where a sound aircraft plowed into the ground. We looked at these 36 mishaps in considerable detail in an attempt to find the common factors that are within our control and to provide this information to those of you who are out having at it.

All types of aircraft have shown up in this accident category – all of them. The majority, however, involve fighter/attack aircraft on low-level missions.

In 25 of the 36 mishaps, no matter what type aircraft was involved, the main element, or the last straw, if you want to call it that, was the fact that the crew, regardless of what else they were doing or trying to do, were not flying the airplane. You can call this distraction, inattention, channelized attention, task saturation, loss of situation awareness, or any other of those slick words that we have used. We are not really sure just what they were doing at the time of the mishap, but we know they weren't flying the airplane. We need to discuss some common elements that can distract a crew from flying the airplane at a critical time.

Fifteen of these mishaps occurred during formation flight, and it shouldn't surprise us that in 12 of the 15 it was a wingman that crashed. In two, when lead went in, the wingman did too. The wingman's problem is unique. He is attempting to maintain a tactical formation position, clear the flight, maintain his scheduled altitude above undulating terrain, and remain oriented. At the same time, he is also attempting to look as good as he possibly can. The majority of the people who had mishaps during formation activities probably hit the ground without having the slightest idea they were about to do so.

Eight of the 15 formation mishap pilots were doing the mission element, whatever it was, for the first time:

First time that low,

First time in that formation position,

First time on that range or training area,

First time under exercise conditions or

First time with a combinati
the above.

A good many of these aircr
were multi-crewed. Two-thirc
the aircraft which flew into th
ground while in formation hac
or-more people in them. Twe
three of the 36 aircraft that cr
into the ground during all mis
activities were multi-crewed a
That simply means that everyl
was looking at something else
perhaps the same thing, and n
was flying the airplane.

Another common factor tha
found was the fact that, in 22
36 mishaps, the aircraft were
special missions of some sort.
exercise or special mission see
play a factor in two major resp
The first is that oftentimes exe
conditions and special mission
requirements are not duplicate
the normal training scenario, i
terms of tactics, altitude, and
area over which they are condu
The differences may be only s
but it takes some small additio
percentage of the crew's attent
away from flying the aircraft.

The second factor is that
exercises, or the special missic
environment, seem to generate
feeling that winning, or missio
success, becomes increasingly
important. This results in press
beyond limits, beyond capabili
in discipline breakdowns wher

are stretched or disregarded; t also creates a highly petitive environment for the visors who want to look as and they can.

t these are good problems — we our folks to try and try hard — ur exercises and special ons are really the only way we easure our readiness and ate realism. But it is painfully that many of our crews are t up in exercise activities to int that they forgot the good, procedures they learned in normal training. They paid for those mistakes and we earn from them. The principal nt to learn is that the location ground and its hardness does ange a bit under exercise ions and still merits the same y respect you gave it during l training missions.

good procedures you have l and the tactics that you have ed are the same ones to use exercise conditions. The nces and the newness of a c exercise condition or tactic e recognized before-the-fact. ust then be accommodated, t distraction, to your primary, al, mandatory job of flying chine.

e were a half dozen mishaps h the crews were simply out; and these mainly occur ow-level mission ment. We have heard a lot 00 ft., and that is low in y's book, but the facts are only about 15 percent of the s we're talking about did the mission call for less than 300 ft. The majority were being attempted at 500 ft. So another problem is simply that of being maxed out momentarily in a critical situation.

If you are flying at low altitude, and we are suggesting that anything below 1,000 ft. is low, over undulating terrain and 480 to 500 knots, you must make your critical judgment on action to take as far away as a mile to a mile-and-a-half. Then you count on updates as you fly along to shade the initial judgment, while at the same time making another longer term decision about terrain and the distance.

You are splitting your attention between a formation position and a leader who is changing course; between maintaining visual contact with target or navigation point and the critical updates that you needed to avoid terrain that is changing. If you look at the wrong place at the wrong time, or too long, or get priorities mixed up as to what to look at, when, then you become highly susceptible to a collision with the ground.

In summary, our reports tell us that low-level missions at 100, 500, or 1,000 ft. require priority attention on flying the airplane — all of the time.

- They tell us that in almost every case where the aircraft is flown into the ground, the pilot and his crew are all looking too long at the wrong place at the wrong time.
- They tell us that when the pilot is distracted or has channelized his attention, if it is a multi-crewed airplane, everyone else is looking at the same thing he is and the advantages of a multi-crew aircraft, in effect, are totally negated.
- Formation flying at low level, regardless of how the formation is spread, is an activity that is apt to channelize attention away from flying the aircraft.
- Our reports tell us that special missions, including exercises, deployments, etc., result in our crews pressing harder. Discipline breakdowns occur where rules are stretched and procedures ignored. They also result in supervisory personnel becoming more enthusiastic about mission accomplishment and winning.
- The exercise and special mission activity can be conducted with new ground rules over unfamiliar territory, using ad hoc tactics, each in itself requiring more attention away from flying the aircraft — more than required during the normal training mission. When it is a "first time" mission of any kind, your distraction quotient increases substantially.
- And finally, these costly mishaps tell us that good procedural habits and tactics, along with good crew coordination habits, will tend to require less attention away from flying the aircraft than the extemporaneous approach.

There are other aspects of collisions with the ground at the periphery of the problem, but what we have discussed here focuses on the center of the action — where the majority of our mishaps occur. ■

CROSS COUNTRY NOTES

■ The "Rex Checkers" traveled around the good old U.S. of A. again and picked up a few pointers worth passing on:

TO THE BOSSES We've noticed a trend (especially in one MAJCOM) toward the "non-mission" flight line folks being overextended and undermanned. Base Ops seems to get tapped often for personnel reductions, squadron details and base extra duty. Transient alert (or maintenance) sections also seem to fall prey to personnel slot stealing more often and yet the workload doesn't get any less!

Commanders—take a hard look at your flight line transient operation. Not only is this the front door of your house for visitors, but it is also one of the most mishap-vulnerable areas of your air patch. Two bases we recently visited didn't have enough people manning TA to legally follow the tech data for the refueling or towing of certain aircraft. This is not the area for slot cuts or the dumping of duties. Ops and TA need to be fully manned by sharp, conscientious, motivated professionals! If not, a transient aircrew may die!

TO THE CREWS Transient service is a two-way street! Nobody owes you a good turn if you surprise them without so much as an inbound call. Most installations I've visited would understand and work hard to help you after a tough weather divert. I can't blame them, however, for being a little miffed when you drop in unannounced with two aluminum overcasts or a covey of fighters when you could have called.

A related item worth mentioning is the calling of off-times to FSS when you depart a civilian field. Several airfield ops types mentioned on the last trip that they had received surprise visitors in this manner. Don't forget that a base won't get an inbound on you unless you call flight service after departing a civilian field. By the same token, you may beat your inbound to a base if you have a 30-minute or less leg and changed centers several times. Moral—call ahead if you have a short leg. That way your destination can be ready for you!

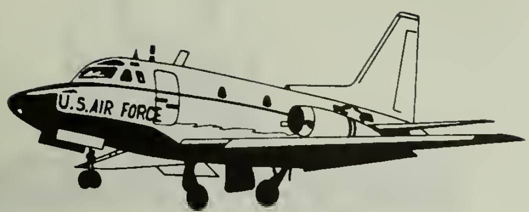
Another item that crops up in debriefs with airfield managers is that many crews are not reading the books. When you plan (or divert) into an airdrome, it is your responsibility to read the IFR supp and check the NOTAMs for the destination. I personally ran into a crew that was hassling a dispatcher over a PPR number. I questioned if they had checked the IFR supp and they sheepishly admitted they had not. Part of being a professional aviator is checking all sources of info about your destination. Good transient service is a two-way street.

RETAINED AWARDS

CARSWELL AFB Somewh limited transient services hou but who hasn't anymore. Qua are good, food available and approach service super. TA w work hard to give you a good turn. Their PPR status is only sequence and prevent traffic saturation, not to keep people out. They say "y'all come."

TINKER AFB Some proble relating to transport and their downtown contract quarters, best bet is to make reservatio ahead. Other than that, the T folks will give you good servi and a helpful welcome. Ram getting a little crowded, so if you're leading a flock or drivi many-wheeler, warn 'em!

GRIFFISS AFB A good tur Single runway and some loca operational considerations sh jog your thinking toward havi



ɔcket alternate — even VFR.
f the folks do good work for
ients.
NDALL AFB Still the best
peration I think I've seen
far. Hard work, conscientious
ng and new ideas make the
all transient a truly
ssional group. Good
ers, food and friendly folks
nue to make Tyndall a
stopover.

ADDITIONS

GUIRE AFB Outstanding
A beautiful Base Ops
, really top-notch billets
lubs make McGuire a good
ng place. BEWARE — vis is
lly bad, and the traffic
d the area is murderous.
out and know the low and hi
dures. Stop in and visit.
STOVER AFB This trip's
ept secret. The TA and Ops
are top-notch. Quarters
and a terrific consolidated
"Q" reservations are a good
nd you might call Base Ops
have a bunch of airplanes
rge machine. AFRES has
done a good job at
ver.

KIES

often transit a base and
ave time to give the entire
on a thorough evaluation.
e the short stop, we want
s on good comments
ng service.
UTT AFB Still a good turn.
the X-winds and heavies
pattern.
WELL AFB Super TA folks
d a T-39 main tire and
us in 40 minutes chock-to-chock. Only 7,000 feet of runway. Needs close planning on hot days.

ANDREWS AFB Good service! Base Ops has a new face-lift inside and the facility is much more aircrew oriented. Special passenger and area problems require some empathy from crews. Plan your arrival and call ahead.

WRIGHT-PATTERSON AFB Also good service. No complaints during a 30-minute turn!

BUCKLEY ANGB Super service, but really watch that Rocky Mountain summer weather. High altitude will getcha!

KIRTLAND AFB Another high altitude airfield with some wicked winds and TRW at times. TA and Base Ops are both working hard at good service — and succeeding!

PETERSON AFB A busy place with lots of above-ground activity in all directions and mucho ramp construction make this a place for vigilance. Good service, billets and eating facilities! A third place to watch high altitude performance and summer Rocky Mountain weather phenomena.

OVERALL . . .

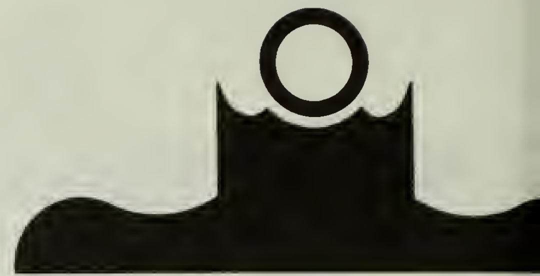
We've noticed some real improvements at several locations. "Rex Riley" committees and workshops are springing up to get agencies at bases to talk together. That's the name of the game — attitude and communication! Good or bad comments . . . write Rex Riley, AFISC/SEDAK, Norton AFB, CA 92409. ■

THE

REX RILEY

Transient Services Award

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AK
PETERSON AFB	Colorado Springs, CO
RAMSTEIN AB	Germany
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
TORREJON AB	Spain
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
NORTON AFB	San Bernardino, CA
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
CARSWELL AFB	Ft. Worth, TX
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayetteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND
VANDENBERG AFB	Lompoc, CA
ANDREWS AFB	Camp Springs, MD
PLATTSBURGH AFB	Plattsburgh, NY
MACDILL AFB	Tampa, FL
COLUMBUS AFB	Columbus, MS
PATRICK AFB	Cocoa Beach, FL
ALTUS AFB	Altus, OK
WURTSMITH AFB	Oscoda, MI
WILLIAMS AFB	Chandler, AZ
WESTOVER AFB	Chicopee Falls, MA
McGUIRE AFB	Wrightstown, NJ



CMSGT DENNIS D. EMMONS
HQ MAC
Systems Management Division
Scott AFB, IL

FLIGHT PLAN
FLIGHT PLAN
FLIGHT PLAN

■ As every aviator flying in the CONUS knows, the completion of a flight plan (DD Form 175) is the primary method of communicating a proposed route of flight to the Air Route Controller. The flight plan must be accomplished in a manner that has the pilot, Base Operations and Air Traffic Controller all communicating in the same language. This communication effort frequently fails when a stopover or delay en route flight plan is involved. The next few paragraphs will deal with these, and other types of flight plans, and hopefully will clarify some misunderstood areas.

According to current rules, a stopover flight plan must include the proposed departure time, departure location, airspeed, altitude and route for each leg of flight after the initial leg. In parentheses, after each leg of flight, the hours of fuel on board, alternate, and ETE to alternate, if appropriate, are included. Here is an example.

IFR	VFR	ROUTE OF FLIGHT	TO	ETE
X		PSB, J59, SYR, J29, PLB, VAL172015	PBG	1+10
X		P1520, PBG, 460, 290, PLB, J29, PQI, AWD (2+02)	LIZ	0+45
X		P1720, LIZ, 460, 310, PQI, J29, BGR, J79, SCUPP (4+00)	BOS	0+45

If, because of weather or other problems, y
getting behind and are going to miss one of y
posed departure times, you should notify
Service Station and request a new ETD. A
estimate is also in order if you are going t
early at one of your stops and will be requ
clearance more than 30 minutes in advance
original estimate. These actions shouldn't bo
since AFR 60-16 requires that ETA changes
than 30 Minutes (15 for jets) be submitted
service. If you fail to revise your estimates,
find that no clearance is available at som
stream station. Here's another Stopover e
right out of the FLIP.

IFR	VFR	ROUTE OF FLIGHT	TO
X		V100, SUX, V175, V52, STL, BLV180015	BLV
	X	P1545, BLV, 300, 125, FAM, ARG (3+30)	LRF
X		P1700, LRF, 360, 150, LIT, V124, HOT, V71, SPARO, V16, TXK, V278, BUJ, BUJ5 (2+10 FWH 0+10)	DFW
X		P1820, DFW, 440, 350, GWS, J4, ABI, J50, EWN, SSO076094, AR323, SSO265096 PHX, J65, SAC, ILA (6+10) (9+00 MCC 0+20)	SUU

The delay en route flight plan is another
Except for IR routes and air refueling mis
flight plan indicating a delay is filed in a
similar to a Stopover. In the following exa
flight plan specifies an IFR route of flight fr

e Capitol VORTAC, a 30-minute delay at Capitol the route back to Scott.

VFR	ROUTE OF FLIGHT	TO	ETE
	ENL, V313, DEC, CAP ® D0+30 CAP BLV		0+35
	P1700, CAP, 250, 50, DEC V313 ENL BLV	BLV	0+40

tice that the remarks (®) go directly under the of flight. The remarks include the delay time, location and final destination. The final destina- s required in case of radio failure. All remarks rwarded to the ARTCC as part of the flight plan. To" column is left blank for the first leg since try indicates a full stop landing. One more ex- , again right out of the FLIP document.

/FR	ROUTE OF FLIGHT	TO	ETE
	J72, ABQ, ABQ233029 ® D0+30 ABQ REE		0+35
	P1405, ABQ, 450, 270, J72, TXO, AMA, DHT, DHT280044 ® D0+15 UTE MOA REE		0+50
	P1510 DHT280044, 450, 10 DHT255046, R5105 ® D0+15 R5105 REE		1+00
	P1610, TXO270075, 390, 190 TXO RUU250035	REE	0+10

viously mentioned, remarks indicate duration y, location of delay and final destination. The olumn is blank except for the full stop at REE. ts along Military Training Routes have their t of rules. Flight plans must be filed well in e of the estimated departure time (see FLIP because more coordination is required when Training Routes are involved. When filing oute it is not necessary to break your route ments (unless of course you have other types 's before or after the IR portion). The follow- sample flight plan indicating the use of an e.

R	ROUTE OF FLIGHT	TO	ETE
	BLD, EED, IR287, BTY108039, LSV345031 LSV	LSV	1+05

Remarks (in the Flight Plan remarks block):
E2250SNX2305100LC130

The remarks here need some clarification:

E2250 —is the estimated route entry time.
SN —indicate the type mission, in this case Systems navigation.
X2305 —route exit time.
100 —requested altitude after exiting the route.
LC130 —lost communications altitude. This is the altitude the pilot will climb or descend to after exiting the route in event communications are lost after route entry.

IR routes are always flown IFR. VR and SR routes are filed IFR to the route and then VFR. Here is an example of a flight plan filed on an SR (Slow Route).

IFR	VFR	ROUTE OF FLIGHT	TO	ETE
X		V188, ALD V37, NORMS, CHS298042, VAN112017 SR166 ® D0+25 SR166 CHS		0+30
X		P0400, XNO, 270, 50, NORMS, V18, CHS	CHS	0+35

This flight plan is again prepared similar to a Stop over. The first leg shows the aircraft delaying on SR166 for 25 minutes. The second leg indicates the location where IFR will be resumed as well as time, airspeed, altitude, and route to destination.

In effect, the requirement in all the above examples is a separate entry for each route segment when a full stop landing or delay en route is involved (as indicated previously separate entries are not required for delays on Air Refueling or IR Routes). Base Operations Flight Data personnel handle each flight plan entry separately and send individual messages either by voice or teletype to the appropriate FAA facility.

While there are numerous and varied types of flight plans, the examples discussed above are currently causing most of the problems. We will continue to provide articles to *Aerospace Safety* advertising, discussing and analyzing flight plans. The goal is better and safer communication among all concerned. ■

What a THUNDERSTORM is NOT

R GARRY S. MUELLER
/ AFB, VA

e weather phenomenon known iunderstorm has been the sub- an infinite number of articles iost as many magazines. Be-f two recent accidents, I would discuss what a thunderstorm

first accident happened late ir and was unfortunately, fatal crew. After entering an area y precipitation, they encoun-urbulence, lightning, and all er adverse characteristics asso-with thunderstorms. Before ıld fly through the heavy rain, raft was hit by lightning. The gnited a residual fuel-air mix-a wing tank and caused a low xplosion strong enough to atastrophic failure of the left he aircraft went out-of-con- crashed. This accident had weather factors of what we a thunderstorm.

econd, and very recent, ac-as also caused by lightning. accident which resulted from hunderstorm is not. The sce-almost identical to the other Again, the flight was being d in an area of heavy pre-ı. Here is where the similari-oorarily end. There was no ce, heavy hail, etc., com-issociated with thunder- Since the aircrew had not any weather advisories warn-ı of thunderstorms, they they were encountering a ıvy rainshower. They also oy lightning, causing a wing -air mixture explosion and nic failure of a significant f the left wing. Thanks to ew's superior handling of this emergency, the aircraft was safely landed. This accident was caused by what a thunderstorm is not.

A thunderstorm is not always the big black cloud with an anvil top, turbulence, heavy hail, etc., that comes to mind when a weather forecaster mentions that one word. Thunderstorms have different characteristics and often vary, depending on the geographical location, time of year, and many other factors. The absence of typical thunderstorm phenomena does not mean no thunderstorm – it may be what a thunderstorm is not.

Current Air Weather Service policy requires weather forecasters to use the term "thunderstorm" when referring to any cumulonimbus cloud. Weather briefs which predict, and I emphasize predict, thunderstorms are often overly pessimistic because cell buildups and exact locations are tough to forecast. As we all know, the buildups often do not even happen. The key point is that the prediction is advisory in nature and should not be ignored.

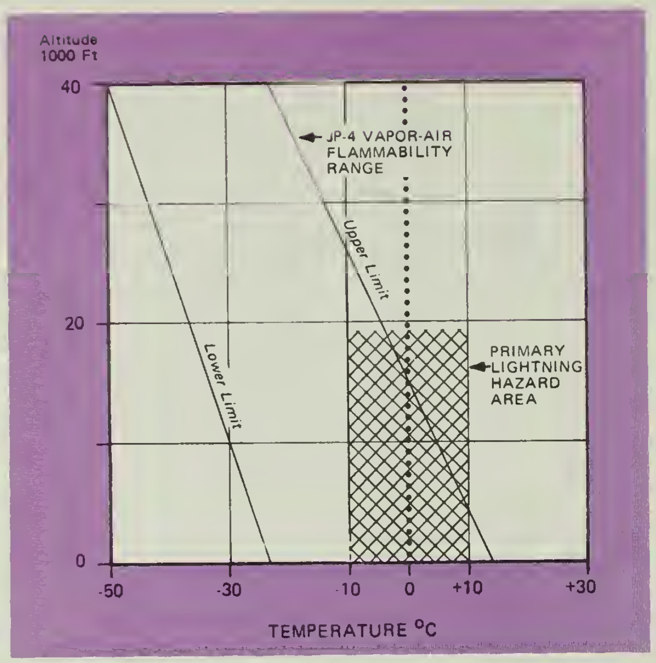
A recent study revealed that 80 percent of reported lightning strikes occurred when aircraft were in clouds, with rain, some turbulence and an outside air temperature within 8°C of the freezing temperature. The remaining 20 percent is the category the last accident fits into because of what a thunderstorm is not. Lightning is basically an atmospheric electrical discharge process which often travels for several miles. The electrical current can be as much as 200,000 amps but is normally in the range of 20,000 to 30,000 amps.

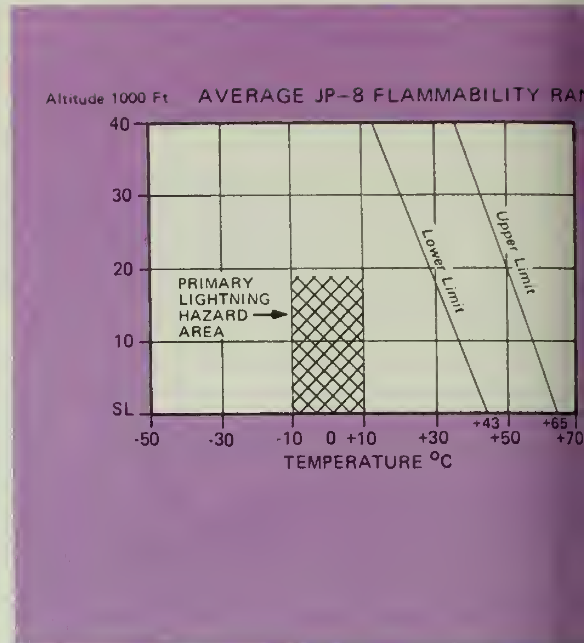
Clouds become charged by vertical movement of water droplets and ice crystals within the clouds. This movement causes either a positive or negative charge center to develop. The primary negative charge center will be near the −5°C level; the main positive charge will be near the −20°C level. A secondary positive charge is also centered near the 0°C level. Simply stated, the intense negative charge is at the cloud base and the primary positive charge is somewhere in the upper half of the cloud. The intense negative charge in the area of heaviest precipitation is so strong that it also induces a positive charge in the normally negatively charged earth's surface. The region of heaviest rain is normally near the negative charge or cloud base.

Extremely high electric potentials (voltages) result from the charge distributions. When the voltages reach a critical value, the atmosphere begins to ionize between the charge centers. (In dry air, the critical value is 300,000 volts for each meter between the charge centers.) The resultant electrical discharge from the negative center towards the positive center travels by a path of least resistance. As this streamer approaches within 10-50 meters of the positive charge, a positive streamer reaches out to meet it, creating an ionized path between the two unlike centers. The positive charge moves supersonically along the ionized channel creating the successive flashes and bangs we know as lightning.

It has not been determined whether or not an aircraft will trigger a lightning discharge. How they become involved also has several theories. The metal skin of an aircraft is more conductive than the atmosphere. As the initial negative charge travels the path of least resistance, it may go through the aircraft and continue into the atmosphere.

It is also possible that an aircraft may generate positive streamers which link to the negative one. The charge then follows through the aircraft and continues into the atmosphere. Either way, the aircraft actually becomes a link in the electrical





circuit. There is always a point of entry and exit from the airframe.

Figure 1 shows that JP-4 is well within its flammability range most of the time the aircraft is in the temperature and altitude regime conducive to a lightning strike. (As shown in Figure 2, JP-8 has a flammability range well outside the primary lightning hazard area.) Lightning can ignite fuel vapor by burning through the tank skin and arcing into a tank. It can also explode a tank by inducing overvoltages in fuel level probes or heating the skin of the aircraft to a point temperature above the fuel's flash point.

Lightning can cause other hazardous airborne emergencies. Radomes have been disintegrated by the explosive expansion of air inside as the stroke seeks the metallic radar disk. Popped circuit breakers, blown fuses, burned wiring, or total electrical failure can result if the electrical system is hit. Indirect effects include magnetization of ferrous metals around navigation systems, causing unreliable compasses. Effects to the aircrew can be mild shocks to temporary blindness, in addition to the initial reaction of "severe apprehension." However, electrocution is normally a very minute possibility.

Using an airborne radar to detect and avoid all buildups can add to a false sense of security in areas of heavy rainfall. The National Severe Storms Laboratory has determined that the relationship between turbulence and radar reflectivity of echoes (rainfall rates) is poor. Radar detection of thunderstorms is possible only because the precipitation droplets of the storm reflect the radar beam back to the receiving antenna. There is no absolute way to determine on a non-doppler radar the difference between a heavy rainshower and a thunderstorm. Therefore, although the use of airborne radar is an effective means of painting areas of bad weather, it is not foolproof.

Heavy precipitation is the pr which creates the charge distrib required for lightning. Aircrew reduce the probability of a ligh strike by avoiding the prime temperature and altitude reg Any cumulonimbus cloud shou treated as a thunderstorm.

It may be what a thundersto not. ■

The author acknowledges the p sional and comprehensive investiga a recent SAC KC-135 lighting strike similar article recently published MAC Flyer.

IEWS FOR CREWS

er information and tips from the folks at Air Force Manpower and Personnel Center, Randolph AFB, TX.

OL BEN GANN • Chief Bomber/Tanker Career Management Section

or those of you who are serving, or will serve, a as a B-52/KC-135 crew member at one of SAC's thern tier'' bases, some interesting events have rred over the past 18 months. When polled, the rity of people in the USAF consider SAC's northern ases (Malstrom, Minot, Grand Forks, K I Sawyer, smith and Loring AFBs) as the least desirable state-ssignments. Although that reputation is not neces- justified, it has been perpetuated by ''old wives' '' about the snow and the cold.

gardless of the validity of those ''old wives' tales,'' erceptions do exist. To dispel rumors and clarify ons posed to him on a recent trip to Grand Forks Minot AFBs, General Ellis, CINCSAC, directed a to determine how long aircrew personnel were ing at the northern tier bases. That study revealed en valid perception among ''Northern tier'' aircrews eir counterparts in other career fields were spend-orter tours in the ''cold country'' than they were. ncrease overall aircrew retention and simultaneously morale at the ''northern tier bases, the assignment at SAC and AFMPC worked out an extensive nent to ensure a ''light at the end of the tunnel'' ose actively maintaining SIOP/EWO currency lling aircrew alert duty.

ssence, the agreement contains three key elements v members at northern tier bases. First, a maximum n station (TOS) has been established at the three-oint for reassignment consideration originally shed at four years but subsequently lowered to ears). Secondly, because individual crew mem-n now determine firm departure dates, they can nore definitive career plans. Lastly, and probably nportant, you will be personally contacted by SAC MPC to give you a more active role in your re-nent following your current northern tier assign-

mechanics of the program were designed so h crew member at a northern base will be initially ed by a SAC rated officer assignments representa-or to reaching three years TOS. You then have the o either move or remain for an additional year. ecide to move, you should update your AF Form eer Objective Statement) and send copies to SAC MPC to give us your most current preferences. nally, we'll contact your Wing Commander or DO ments on the impact of your loss to the unit— e some cases that may require short delays due to uirements or manning. Any delay would normally be no longer than two months.

After coordination is complete, we'll search for an assignment that matches an Air Force requirement to your personal desires. Some assignments can be found at the Air Staff, MAJCOMS, or overseas (accompanied or unaccompanied), but the majority of your assignments will be to rated positions in other SAC wings in the CONUS. Once we obtain a list of your assignment preferences, we'll contact you to determine if you want one of the available assignments. If we can't satisfy your desires at that time, we'll continue to try—with a guarantee that you'll be contacted again within a year. You may continue to decline until your desired assignment is available or until becoming the most eligible for PCS, at which time different criteria apply.

Since implementation of the northern tier rotation program, 482 crew members have been contacted and 126 have requested reassignment. Of those requesting to move, 120 (95%) have received one of their first three choices listed on their Forms 90. (The majority of those desiring to remain on station do so to upgrade in their aircraft or move into the wing staff to enhance their positions for future assignments.)

Wing staff personnel are not currently included in this program, but their average TOS at the northern tier bases has been about four and one-half years. Staff members at northern bases are worked for assignments in the same manner as individuals at non-northern tier bases. Again, your most important contribution to this process is a current Form 90.

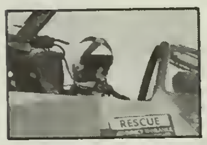
For those who are not currently stationed at a northern tier base, we realize that most of you are concerned about what your chances are of being reassigned to the ''cold country.'' Less than 25 percent of SAC's rated positions are at the northern bases; however, because we do not reassign anyone to one of the six northern tier locations for a second tour unless he/she is a volunteer, probabilities increase to something greater than one in four, but remain at less than 50 percent.

Historically, our crew members have completely omitted listing any northern bases on their Form 90s. Although you may not want to go, it may be your turn. Please help us by at least listing the northern tier bases in order of preference in the remarks section of your Form 90. That will at least give you a greater opportunity of being assigned to a northern base you prefer, if selected for such assignment.

You may not know it, but there are some advantages in being assigned to a northern tier base. Climate and lo-

continued on page 25

OPS topics







BINDING THROTTLES

A pilot returning an F-4D from installation facility for TCTO 1F4-1056, VOR/ILS modification reported throttles binding in flight. Crew chief at Nellis AFB attempted to clear the problem, but could not, and asked for a quality control inspection. Panel 9L was removed adjacent to the throttle quadrant area. Four plastic wire bundle ties were found wrapped around the VOR/JLS wires and the throttle cable. Movement and operation of the cable was hampered by the ties. Removal of the ties solved the throttle binding.

CREDIT THE CONTROLLER

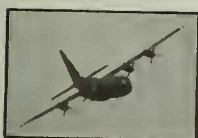
The usual near midair collision summary reads something like this: "Pilot saw other aircraft and took immediate evasive action. Miss distance estimated at 200 feet . . . Light plane did not show on radar." Every day controllers help by warning of traffic, but they don't get a lot of credit. In a couple of situations recently, the pilots of a T-38 and a T-37 credited controllers with preventing an accident. Apparently, in neither case did the pilot of the other aircraft see the Air Force birds. Keep it up, folks.

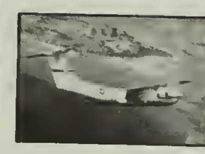
TANGO IN TRAFFIC

Here was the situation: Ai
on short final; B on three mi
C directed by tower to exten
wind to follow B as number 3
A on short final, mistook it f
turned final in front of B w
had to take evasive action
C. This episode once again
us you can't take anything for
Both pilots and controllers
sure as to identification of ai
the pattern. Don't relax unti
put out the fire.

O-2 PROP LOSS

It was a four-ship combat
profile for O-2s, one of which
as a FAC and the other t
fighters. After pulling off ar
the pilot of one of the *fighte*
loud thump and a loss of thr
rear propeller had separated,
the left boom and tearing a lar
It also severed an elevato
rudder cable. The pilot shut d
engine and got enough eleva
trim to maintain flight, altho
bird wouldn't hold level abo
ft. – 500-800 AGL. Flight to
airport was uneventful unt
25 feet AGL on final when
pitched up. Control was mai
but another pitch at touchdow
out the nose gear. The airc
stopped after a skid off the
and the pilot walked away
Nice work.





‹S IN CREW
›ARTMENT

ut an hour after a B-52 took e heating element in the co- windscreen shorted and the hattered. The pilot declared ergency and descended to ft. on the way back to base. fumes were detected so the hief investigated. The crew 100 percent oxygen, and the ccasionally removed one side nask. Finally he removed the A few minutes later he was unconscious. 100 percent brought him around. Ap- fatigue, 24 hours with no nd carbon monoxide caused of consciousness. The unit ended a T.O. change to en- ygen is used in the presence us fumes.

G THE ACT TOGETHER

ncing an airline crash at- to the captain as the most cause and two other crew as contributors, the NTSB nded to the FAA:

an operations bulletin to all operations inspectors direct- to urge their assigned oper- nsure that their flightcrews ctrinated in principles of ck resource management, cular emphasis on the merits ative management for cap- assertiveness training for cpit members."

In case you have trouble with that, they are talking about crew coordination and they cited five other airline accidents to support their position.

Let's take a lesson from that, whether our crew consists of two in a fighter or as many as six in a many motor. We have had several examples during the past year where better crew coordination could have prevented the mishap. 'nuff said.

BIRDSTRIKE

A 3-5 lb. turkey buzzard tried to stop an F-4C. The bird lost, but. . . . It struck the aircraft just below the right hand windshield, smashed the right quarter-panel and entered the front cockpit. Bird remains struck the pilot in the helmet and right arm and broke his visor, which was in the down position, directly in front of his right eye. The WSO was struck on the right side of his neck by flying glass and bird remains. Due to the *stunned* state of the aircraft commander, the WSO began a climb and flew the aircraft until they got things sorted out. Although their viz and comm weren't too good, they made a wing approach to a safe landing. Post strike assessment revealed extensive damage in the front cockpit to the instrument panel, right quarter panel, and canopy. Neither crew member was seriously injured—a case for visors down and excellent crew coordination.

NEWS FOR CREWS continued

tion aside, morale is higher than most expect due to the camaraderie within the squadrons and the outstanding leadership apparent at those particular bases. Additionally, a somewhat lower rank structure has resulted in more rapid career progression throughout the wing with attendant increased responsibility.

Those who have not had the "opportunity" to serve at Minot, Loring, etc., can expect to serve at least one tour, voluntarily or otherwise. Accepting the fact that northern assignments are inevitable, we hope that the personalized attention you receive will be viewed as steps in the right direction toward making northern tier assignment more acceptable.

If you have additional questions, please contact HQ AFMPC/MPC-ROR3, AUTOVON 487, extensions 6256/6378 (Lt Col Ben Gann).

ABOUT THE AUTHOR,
Lt Col Gann is currently assigned to AFMPC as Chief of the Bomber/Tanker Career Management Section. He is a command pilot whose background includes flying tours in T-37, O-2 and B-52 aircraft and duty as maintenance supervisor/squadron commander in the 19th Bomb Wing at Robins AFB, GA. ■

F-102 PILOTS REUNION

A reunion is planned for November 9th and 10th at Sheppard AFB, TX, in conjunction with dedication of a pedestal mounted F-102 aircraft. All interested F-102 pilots contact:

Col John M. Franklin
4300 Shady Lane
Wichita Falls, TX 76309
Phone (817) 692-6081 ■

HEADS UP & OUT

CAPTAIN GENE MILLER
1868th Facility Checking Squadron
Rhein-Main Air Base, Germany

Radar is a security blanket that we can't let lure us into a false sense of security.

■ We are all told quite often to keep our heads out of the cockpit and look for other aircraft. But, still, here we are being vectored around the pattern or just have been handed off to approach control and are in radar contact. The fact that someone is watching us can lull us into a false sense of security. We continue to follow our headings and altitudes and occasionally find the traffic that was pointed out to us.

Most of the articles we read about near misses and constant vigilance on our part stress the pilot-controller combination — the human aspect. This article will point out some of the lesser known reasons for why radar doesn't identify all targets.

Radar contact with any aircraft is dependent on one primary factor and that is having a radar signal return strong enough so that it will be displayed on the controller's scope. Controllable factors in this process are transmitted power, sensitivity of the equipment and antenna design. Uncontrollable factors are target range and target size.

A radar pulse transmitted from an antenna would tend to travel away from the source in a spherical shape. The area of the sphere is proportional to the square of the distance from the antenna. This gives us the familiar inverse square law of radiation. Now imagine an aircraft that reflects part of that energy back toward the antenna. It too follows the inverse square law. The net result is that the radar signal reaching the antenna is now proportional to the transmitted power divided by the distance to the *fourth* power!

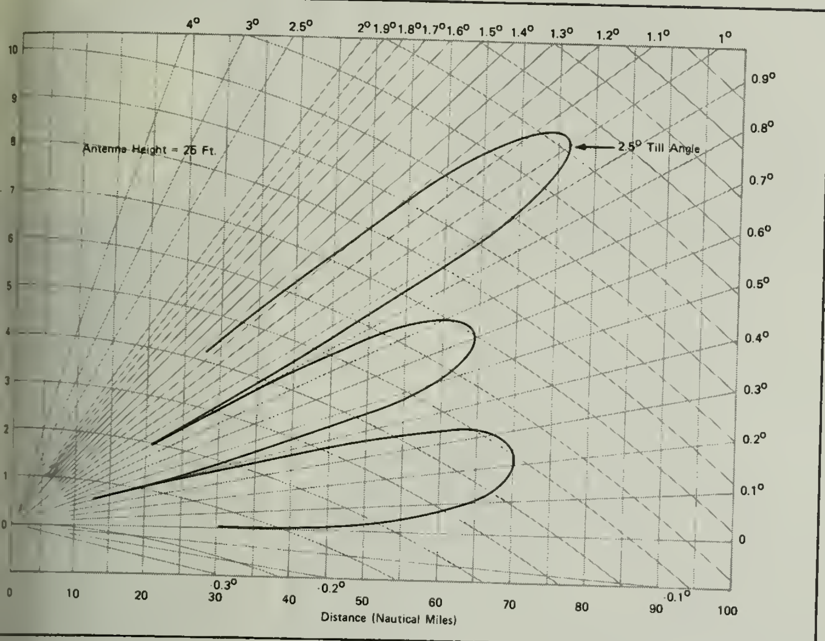
The point here is that a lot of power is necessary for a radar unit to see an aircraft. Typical values of power for the average approach radar would be near one-half million watts transmitted as a pulse for a millionth of a second. The focusing action of the antenna also contributes by increasing the intensity of the wave about one or two thousand times. Receivers are also very sensitive. The minimum discernible sig near one millionth of a milli watt (10^{-13}).

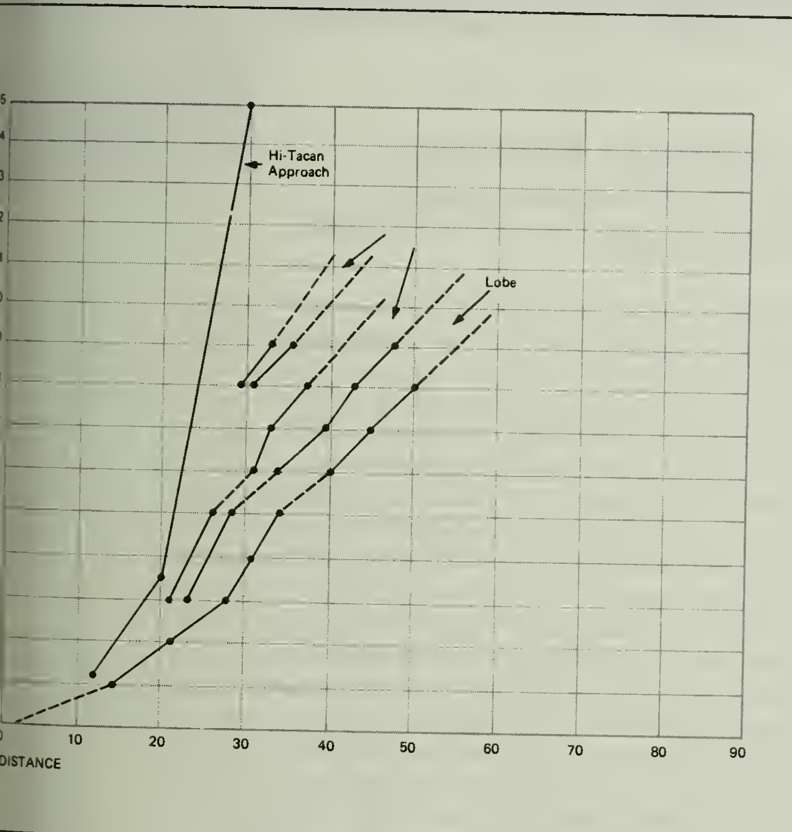
Thus the radar is operating both very large and very sma amounts of energy caused by range and size decreasing th For example, at 10,000 feet should be visible at 47 miles KC-135 would appear at 58 The practical application is t you may be visible to the co the light aircraft that just ab into you may not be. And n do anything about it.

Now you say that the clos come to the base, the more the controller can see and th risk of collision. Generally t true except for environmenta limitations.

The most insidious effect coverage is a phenomenon v called lobing or multipath propogation. A portion of a transmitted energy will be r from the earth in the vicinit antenna. When this reflecte and the direct wave recombi actual received energy will or less than the original dire depending on the geometry The result is a fingered lobi similar to Figure 1.

Obviously, the effects of





e detrimental. One aircraft can
a weak area, or null, and
n invisible to the controller
much closer than predicted by
overage indicator. Thus you can
ow you can be in the strong
lobe) while the aircraft above

you can be invisible because it is in null. For example, a T-39 can be seen as far out as 60 miles while in the lobe but can be invisible as close as 20 miles when in the null.

One obvious correction factor is to destroy the smooth ground around the antenna that produces the reflection. But that can't be done in the vicinity of the runway. Another complicating factor is the atmosphere and nearby obstructions. The atmosphere guides the radar wave in a path depending on the conditions at the time. This causes the lobes and nulls to change position. If conditions are severe enough, atmospheric holes can develop. Of course, nearby obstacles like trees or hangars on the horizon can hide an aircraft until it is above the line of sight.

An actual radar coverage pattern is a combination of all these factors. Figure 2 is an actual coverage pattern obtained with a T-39. The lobes and nulls are obvious and lead to gaps in coverage of several miles. A tree line on the horizon limited the low altitude coverage. Normally, with no obstructions, an aircraft should be visible down to 260 feet at 20 miles. Also evident is the shift in the pattern produced by the atmosphere. The lower half of the pattern was measured in the evening and the upper half on the next morning.

Radar or no, you still have a good reason for looking around. Radar is an aid. Like aircraft, it has limitations, and understanding these limitations help you fly safer. ■

FIRST LIEUTENANT

Coleman Hampton

355th Tactical Fighter Squadron
Myrtle Beach Air Force Base, South Carolina

■ On 5 October 1978 Lieutenant Hampton was flying an A-10 Thunderbolt II as a wingman in a two-ship flight. He had made a 100-foot AGL ingress and a simulated strafe attack then jinked off the target into a narrow, upward-sloping valley. When he attempted to pull up, he found the stick restricted fore and aft with little elevator authority. Dangerously low, he made a "knock-it-off" call and cleared the valley trees by only a few feet. Lieutenant Hampton declared an emergency and maintained a shallow climb to 5,000 feet AGL where his flight lead/chase confirmed the restricted elevator travel. He performed a controllability check which indicated some pitch control as slow as a 130-knot landing speed. As the gear raised, the control stick froze with the aircraft nose in a shallow descent. Switching to manual reversion flight control and slowing the aircraft, he used both hands on the stick to stop the descent. With the aircraft recovered, he reengaged normal flight controls and flew 120 miles to Fort Campbell, KY. During this entire flight, Lieutenant Hampton had to use both hands and considerable effort to maintain a level flight attitude. Approaching the landing field, he made another controllability check before attempting to land. As he lowered the gear, the nose of the A-10 suddenly fell over in a moderate descent. Before preparing to eject from the aircraft, Lieutenant Hampton stood on the rudder pedals and used both hands to exert maximum physical pressure on the stick. The control stick suddenly broke free, and he executed a normal straight-in approach and landing. Investigation of the aircraft revealed that a nonissue wrench had been left in the control cable area of the aircraft. Lieutenant Hampton's skillful reaction to a serious emergency resulted in the safe recovery of this aircraft. WELL DONE! ■

☆U.S. Government Printing Office: 1979

TATES AIR FORCE

Vell Done ward

sented for
ding airmanship
professional
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rdous situation
d for a
nt contribution
to the
tates Air Force
ent Prevention
rogram.

LIEUTENANT COLONEL

Richard M. Sanders

108th Tactical Fighter Wing
McGuire Air Force Base, New Jersey

■ On 15 November 1978, Colonel Sanders was flying an F-105B as number one in a flight of six. After post-strike refueling, the flight climbed to FL 270 for RTB. Approximately 5 minutes after level off, Colonel Sanders heard a loud double explosion and compressor stalls. He retarded the throttle to idle and was told that he had fire coming from the tail pipe; however, it was confirmed the fire was coincidental with the compressor stall and that the aircraft was not on fire. Evaluation of engine instruments indicated engine problems: Oil pressure was low, and compressor stalls and heavy vibration were experienced when the throttle was advanced above 84 percent rpm. This power setting was incapable of supporting level flight. Colonel Sanders was advised the closest emergency airfield was 40 miles away. An emergency fuel system was selected but was ineffective. The throttle setting was too low to initiate minimum/extended afterburner, and Colonel Sanders felt ejection was inevitable. He sighted the emergency field at approximately 8 miles and maneuvered his aircraft to a short final approach. A bailout area was also selected in the event of an ejection. At 2,000 feet AGL, he elected to go for the field, configured the aircraft for landing on a ½-mile final and landed on the first 200 feet of the runway. Colonel Sanders' outstanding airmanship warrants a WELL DONE! ■

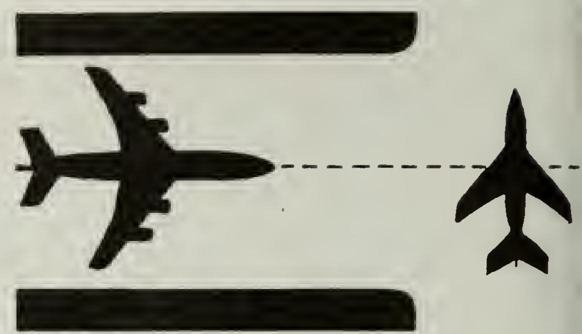
STOP FOD TODAY!!

AEROSPACE

AFETY • MAGAZINE FOR AIRCREWS

SEPTEMBER 1979

MISHAPS
On The Runway



■ After landing, a 747 was steered off the pavement at high speed to avoid colliding with a 727 which was taxiing across the runway.

Weather at the time was 300 feet overcast, visibility ½ mile, RVR 3000, light freezing rain, fog and haze. Time 0911 CST. The 747 broke out at approximately 300 feet, but then went into what the captain described as a "whiteout condition." Landing lights were turned off to minimize light reflection.

Touchdown occurred 1000 to 1500 feet from the threshold. Two engines were reversed (because of an inoperative reverser), and about that time the crew observed a 727 approximately 2500 feet ahead, holding short of the runway on the parallel taxiway to runway 14R/32L. The 727 was then observed to begin slowly taxiing across the runway from left to right. The 747 first officer transmitted "Watch out Delta," over the tower frequency, but the 727 crew did not hear the warning because they were monitoring ground control. Initially, the 747's captain attempted to avoid the 727 by steering toward the right side of the runway, but soon it became obvious that there was insufficient clearance.

After ground control cleared the 727 to cross runway 9R, the first officer and captain reported that they looked toward the approach threshold and saw no traffic. After entering the runway, the first officer looked again and saw the 747 closing fast. The first officer yelled "Stop," and the captain quickly braked to a halt. By this time, the 747 captain had turned his airplane approximately 18° right of the runway heading and applied full right wing down control deflection. It is not known whether the wings were level as the 747 passed the 727. Runway departure occurred at the southeast corner of the runway/taxiway intersection, in excess of 100 KIAS.

The 747 plowed through three-foot deep snow, shedding the number 2 engine, collapsing both wing gear and nose gear, and severely damaging the lower forward fuselage, right inboard flap and number 3 pylon, before stopping 100 feet right of the runway and 100 feet west of the North-South taxiway.

Nine days later, a Falcon Fan Jet and a Beechcraft Model 18 collided on runway 9 at Memphis International Airport. The Beechcraft had landed on runway 35R and the flight was cleared by the ground controller to taxi across runway 9. The Falcon Jet had been cleared t on runway 9. The planes collided as the Beechcraft across the runway. Both aircraft were damaged, one was injured.

These two accidents and a near miss in a similar prompted the NTSB to issue a Safety Recommen to the FAA, part of which is quoted below.

"Although the circumstances surrounding these dents were different, all have one element in co with respect to air traffic control (ATC) operationa trol. In each case one airplane was controlled by the controller and the other airplane was controlled local controller. In two of these cases, the groun troller and local controller failed to effect the re coordination. In the third case no oral coordinatio required; a local facility directive allowed the controller to clear aircraft across an active runway the airport surface detection equipment and Brite displays were operating and radar observations ground controller revealed that no traffic conflict e

"In all three of these mishaps, ATC had auth the pilot to taxi on or across an active runway. In them, the reported visibility at the airport was mo adequate to enable the ground controller to m visual surveillance of his traffic, although hours o ness prevailed. In the other occurrence, reported vi was ½ to 1 mile in daylight conditions."

The NTSB then recommended FAA alert cont and pilots to a serious safety problem, with em on the need for both groups to "maintain greater surveillance in taxi operations involving runway ing."

While we haven't had a serious problem of this recently, we have had several cases of vehicles of v kinds on runways during takeoffs and landings. W mentioned some of these in *Ops Topics*.

The lesson to be learned from these mishaps vious. Controllers must maintain control and ai must be very cautious when crossing active runway same applies to any vehicle operators who drive on ways. We certainly don't want another Tenerife. (So Pan Am's *Crosscheck* Feb/Mar '79; NTSB Safety R mendation A-79-42 and 43.) ■

TED STATES AIR FORCE

AEROSPACE

SAFETY MAGAZINE

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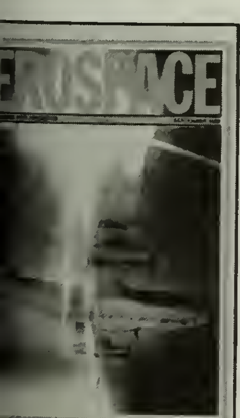

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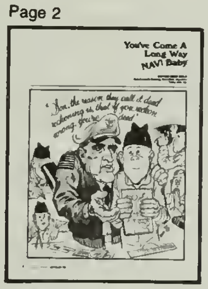

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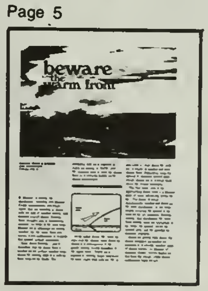

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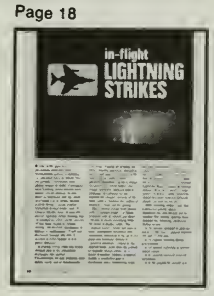


SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

You've Come
Long Wa
NAV! ~~Bal~~

CAPTAIN DREW
964th Airborne Warning and Control Sq
Tinker AF

eprinted from the recent pages f the Interceptor Magazine, we offer ou an article with an insight to ne changing world of the Nav.

It was 5 years ago this winter en I directed my maiden vigation voyage on the vintage 29. It was a navigation route, erland south. My primary means navigation was map reading, and lotted my course by sightseeing. er the copilot's shoulder I spotted grain elevators at Tulare. "Turn t here," I insisted. "Head for se power lines at Visalia."

"Say again, pilot. You say we ve not even passed the Fresno CAN?"

"Don't know about that, pilot. course in radio aids isn't until xt week!"

"Sure! I'm sure I know where 're at! See that dog race track xt to that football stadium? Or is t a drive-in movie next to a lroad yard? It doesn't matter ich, Tulare is the only city in the ley big enough to have any of se things and it's our turn int!"

"Roger, pilot. You say Los geles Center wants our estimated ne of arrival at Las Vegas? ndby pilot, I'll check in the drift ter and have one for you shortly. t's see . . . 10,000 feet, undspeed 150 knots, 300 miles to s Vegas. . . . Pilot, this is the . We'll be there in 12 minutes.

Through 6 hours of sheer student vigator panic, my instructor ked on in complete vilderment, shook his head, sed his fate and the months ahead en he would have to teach me h advanced navigator mysteries radar, celestial and grid.

After 10 months at Mather, wever, they told me I had mastered those techniques. And the silver wings on my chest proved to everyone I could dead reckon (DR) and shoot celestial right along with Magellan and Columbus. I was ready for the next challenge.

It was a KC-135. I envisioned this four-engine jet to be well-equipped with navigational aids. To my consternation it had fewer than the propeller driven T-29 I left behind. So I spent the next 4 years flying a thousand hours strictly on nav judgment.

I lived the horrors of searching for Hawaii with only pressure pattern.

Of DRing acorss the South Pacific in hopes of finding that dot called Guam.

I survived the fright of spending 12 hours in twilight over the North Pole in grid steering, with only the sextant and few books called the H.O. 249 Volumes to guide me over what seemed like endless plots of ice.

I even suffered the embarrassment of not being allowed to fly on the North Atlantic Tracks to Europe because the KC-135 was not navigationally equipped to ensure track adherence.

Those days are no more.

Today I fly on the world's most expensive airplane. I sit at the heart of a $125 million system called E-3A, an airborne warning and control ship. It is a modified Boeing 707 which demands a crew of seventeen. The E-3A flies at 40,000 feet, cruises at 8 miles a minute, grosses out a 325 thousand pounds, and carries the world's largest *frisbee*® on its back. It has inflight refueling capability and its airborne time is limited only by engine oil requirements.

The navigation system is the most advanced in the world. The navigator can select from a combination of two inertial navigation systems (INS), a doppler radar, and an omega system. Three present position displays are available for comparison along with dual TACAN/VOR's located on the navigator's panel.

The two inertial systems are self-contained units, which rely strictly on gyro alignment. They provide call-up readouts for heading information of track, true heading, drift angle, across track, track angle error, and desired track. They also provide information concerning groundspeed and time to go to any one of nine preset waypoints. The INS also presents an immediate readout of current wind direction and velocity.

The doppler unit is also independent of ground based navigation aids. It provides velocity and drift inputs. It can even be programmed by the navigator to adjust to land or ocean surface environment.

The omega receiver monitors eight ground positioned omega stations, and uses the best four signals to determine position. This omega receiver system gives the navigator complete inflight alignment capability.

The really amazing machine at the E-3A navigator station is the omega computer, which receives position and velocity data from each INS, position data from the omega

You've Come A Long Way NAV! ~~Baby~~

continued

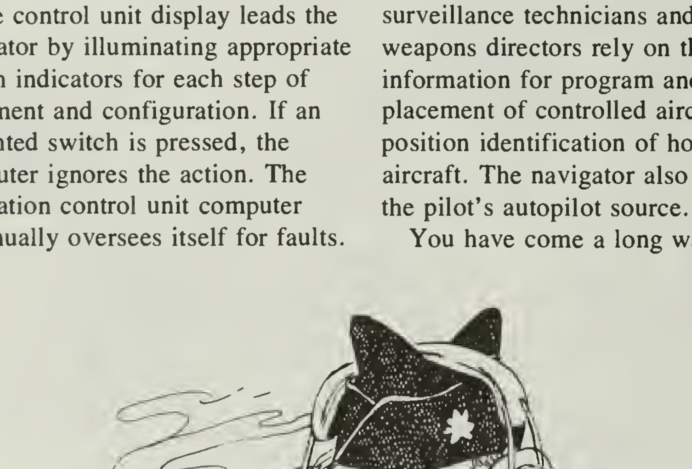
receiver, and velocity and drift data from the doppler radar, then presents the most reliable position of the aircraft. On its display unit, nine waypoints may also be selected. Aircraft steering patterns of line point-to-point, circle, racetrack, or figure eight may be selected. This computer control display unit also exhibits a date-time grouping, a directional vector, altitude readout, and pitch and roll information.

The control unit display leads the navigator by illuminating appropriate switch indicators for each step of alignment and configuration. If an unlighted switch is pressed, the computer ignores the action. The navigation control unit computer continually oversees itself for faults. If a fault is found, the computer displays a warning code indicating which subsystem or component has failed. The navigator must then choose to delete or update that subsystem or component.

All displays on the navigator panel must be continually monitored. It is the navigator's choice of the position information to be fed to the mission equipment in the back of the aircraft. The air surveillance technicians and weapons directors rely on this information for program and placement of controlled aircraft, and position identification of hostile aircraft. The navigator also governs the pilot's autopilot source.

You have come a long way, nav! With all this electronic wizardr displayed, it is possible to fly around the world and not even your divider, plotters, or MB-4 hand-held confuser out of your bag! But two things remain the same. The E-3A still carries a sextant, and the primary means navigation is still dead reckonir

As I sit in the nav's seat on t E-3A, enjoy my in-flight steak, watch colorful flashing lights, a monitor electrical displays that would have marveled Marconi, still remember what my instruct told me when he presented me wings on graduation day. Majo Gator looked at me with those that had seen three wars, twent thousand hours in the air and fo thousand celestial precomps, pu arm on my shoulder and said in Texas drawl: "Son, the reason call it dead reckoning is, that if reckon wrong, you're dead."



ABOUT THE AUTHOR

Captain Riolo graduated from the Ai Force Academy in 1972 with a B.S. Civil Engineering. After Undergradu Navigator Training at Mather AFB, C was assigned to KC-135s at McCon AFB, KS, as a navigator/instructor navigator. He is presently assigned 964 AWACS at Tinker AFB, OK, flyir E-3A. Captain Riolo has a multi-eng commercial pilot's license with an instrument rating. His ambition in life be able to hit a one iron.

beware the warm front

\PTAIN TERRY S. BARKER
50 TCHTG/TTMV
ianute AFB, IL

Summer is slowly, but rsistently, blending into autumn. oler temperatures and longer ghts lead our thoughts to winter th the host of weather hazards that eaten aircraft safety. Usually, en thoughts turn to threatening ather, we think of the cold front cause of its entourage of violent ather, but the warm front also ries a full complement of hazards t impede aircraft operations.

From *Basic Weather I* you'll nember that the warm front is ated on the surface weather maps ere the trailing edge of a cold air ss rests on the Earth. The retreating cold air is replaced by warm air moving to fill the void. We typically tend to view the warm front as a welcome respite to the colder temperatures.

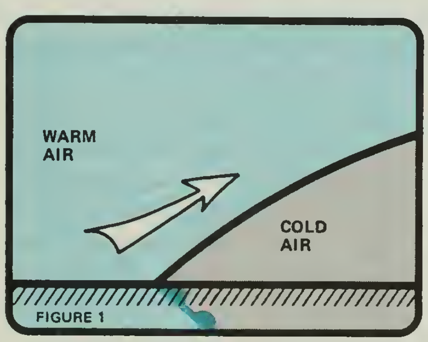


FIGURE 1

In the upper levels, the warm air rises over the colder, more dense air below as a consequence of the gently sloping frontal boundary in the upper levels. Warm air is capable of holding larger quantities of water vapor than cold air, but as the warm air rises above the cold air, it begins to expand and cool, clouds form. Depending upon the amount of moisture carried aloft, clouds spread out in a broad band above the frontal boundary.

The first visual clue to an approaching warm front is a tenuous layer of cirrus advancing across the sky. The layers of cloud progressively thicken and lower as the front approaches. At the front, clouds covering the ground in the form of fog are common. Weather patterns that accompany the warm front depend upon the movement of the front, the stability of the air carried aloft, and the quantity of moisture available.

Stable air quietly rises above the frontal boundary to deposit its moisture as a smooth, uniform layer of stratus clouds. As droplets of moisture collect, drizzle begins to fall from the clouds, while further coalescence leads to rain.

Precipitation falling through the cold layer of air below evaporates and saturates the air to create a low layer of stratus clouds below the frontal boundary.

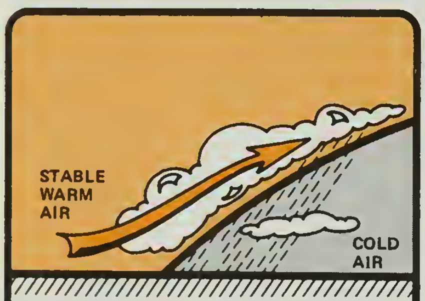


FIGURE 2

Cumuliform clouds and thunderstorms are produced when unstable moist air flows over the warm front. The instability of the air creates rising and falling currents of air that bring about the showery nature within the extensive stratus clouds. Low stratus clouds are produced in the cold air below, but due to the showery nature of the precipitation, low clouds tend to be less extensive.

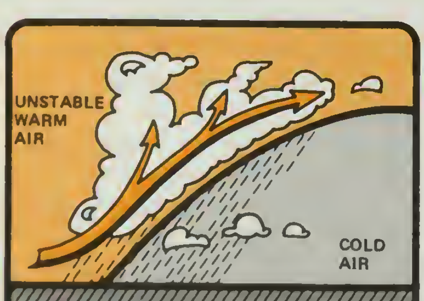


FIGURE 3

The aviation hazards that accompany the unstable warm front are quite similar to those found with a slow-moving cold front, except for the coverage. The warm front has a more shallow slope than the cold front, so the area of weather covers a larger area. Thunderstorms are a major hazard with the unstable warm front since they are hidden within the more extensive stratified clouds. These thunderstorms cannot be detected and avoided unless the aircraft has airborne weather radar.

Icing is also a major aviation hazard that is associated with the warm front. When the stratiform cloud layers of the front are near or below freezing and the aircraft control surfaces at 0°C or lower, rime icing forms on the airplane. The small cloud droplets in the stratified cloud layers freeze nearly instantaneously and entrap small air pockets to give the rime ice its milky appearance. Rime ice is relatively light, but it forms in rough, irregular shapes, and thus robs aerodynamic efficiency.

Mixed icing is found in the cloud layers of the unstable warm front. In the colder layers of the stratiform clouds, ice particles and snow are formed. The unstable cumuliform cells have larger, liquid water droplets that are carried aloft in the updrafts. Aircraft flying through this meteorological situation will see liquid water droplets and ice crystals intermingled. When this mixture is deposited on the aircraft, the icing rapidly forms into a rough irregular conglomerate of clear ice, rime ice and ice particles, adding weight and stealing lift.

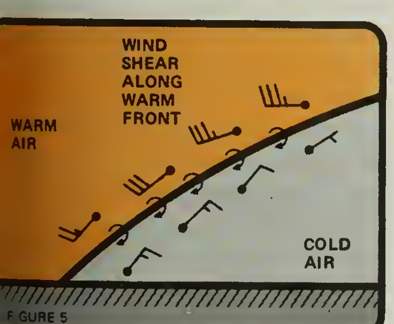
Warm air carried aloft over t
cold air creates an especially
hazardous icing condition. Wa
rain falling out of the warm fro
clouds can fall into below free
air and refreeze. On the ground
is freezing rain, but in the avia
domain, it is severe clear icing
as freezing rain coats exposed
surfaces with a glaze of heavy
aircraft will accumulate damagi
layers of ice when operating wi
this environment. Supercooled
droplets that impact the aircraft
overwhelm deicing equipment
clear icing coats surfaces with
heavy, hard layer. Avoidance i
best measure, but if encountere
climbing to the warmer layers
is the best action.

FIGURE 4

Turbulence can be found with
frontal surface, but the warm fro
will tend to have less than cold
fronts. This is a result of the ge
frontal slope and stable air-mass
configuration of the warm front.
Turbulence occurs in the unstabl
above the warm frontal boundar
because of the rising and sinking

urrents. The majority of the ırbulence reports with warm fronts re a result of wind shears.

Wind shear occurs where ıfferences in wind speed, wind irection, or both, are found in close roximity. The warm front can be a arbinger of wind shears along the ontal surface. Warm fronts can ave winds as much as 180° pposed on either side of the frontal oundary. Wind velocities will pically be stronger above the arm frontal surface than below it. hese two factors can combine to reate a vigorous wind shear otential. The shallow slope of the arm front can bring the wind shear ose to the surface of an erodrome, even when the front on e surface is miles from the area.



F GURE 5

The warm front can create tensive areas of poor visibility nce the warm rain or drizzle falls to colder air below. Cold air is ss capable of holding moisture, so turation of the air produces ratiform clouds and fog. Warm ontal processes tend to shroud tensive areas with fog and/or low ratus ceilings. Vertical depth of the stratus clouds can range anywhere from thin layers to a cloud deck that essentially merges with the stratiform clouds above the warm front. The large areal coverage is significant to pilots because of the necessity of finding a suitable alternate airfield. When flying into an area that will be under the influence of a warm front, query the forecaster with care to ensure an acceptable alternate is available.

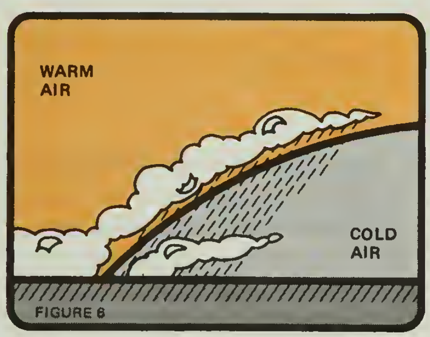


FIGURE 6

Visibility problems can persist with slow-moving warm fronts when haze and smoke are trapped in the cold air. Vertical mixing across the frontal boundary is minimal since the air masses are in a stable configuration. Rain and drizzle falling through the cold layer also acts to reduce visibilities on its own, even before stratus and fog are formed.

Extensive areas of advection fog can form in the warm air behind the warm front. Advection fog forms when warm, moist air flows over a cold land surface, causing a surface layer of fog to form. Although advection fog appears like radiation fog, it is more dangerous because it covers a larger area and is slower to break. Combined with the fog that forms ahead of the warm front, extensive areas can be brought to below minimum conditions.

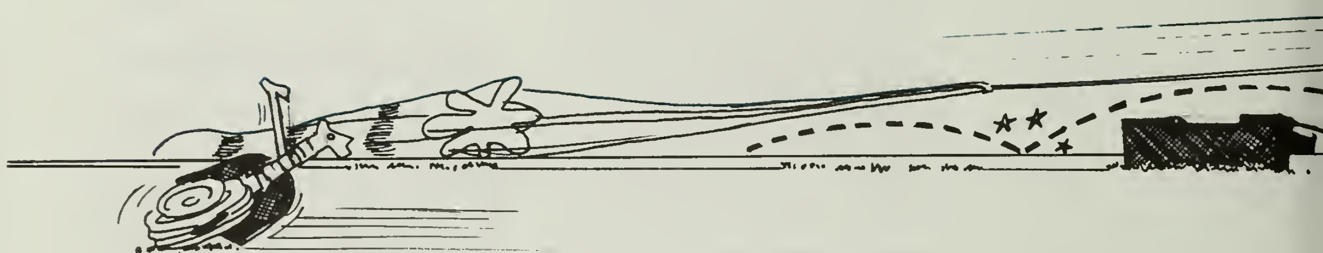
The warm front can pack a potent package of aviators' nightmares. Embedded thunderstorms, wind shears, extensive areas of icing and poor surface visibilities can accompany that innocent-looking front. The ''red'' of warm front can symbolize warmer temperatures, but it also flags ''danger'' to the aviator. If the forecaster mentions ''warm front,'' find out how extensive the flight hazards are with the system so you can prudently plan your route, fully aware of warm frontal weather hazards. ■

ABOUT THE AUTHOR

Captain Barker, a native North Carolinian, graduated from North Carolina State University at Raleigh in 1973, with a Bachelor of Science degree in the biological sciences (biochemistry). He received his Air Force commission through the ROTC program. He continued his training at North Carolina State as a second lieutenant in the basic meteorological program. Upon completion of the school in August 1974, he was assigned to Rickenbacker AFB, Ohio, as a weather officer. He is currently assigned as an instructor in the weather technician course at Chanute Technical Training Center.

CAPTAIN ERNIE R. ARMSTRONG
555th Tactical Fighter Training Squadron
Luke AFB, AZ

THE MISSIN



■ The mission had gone as briefed and two fighters were going home. During the descent, passing 5,000 feet 15 miles out, lead, in a two-seater with another pilot, experienced throttle failure. He analyzed the failure, declared an emergency and told tower he would need the cable. He flew a 200 kt straight-in, touching down at 180 kts, 1,000 feet down the runway.

Then it all fell apart. The drag chute failed; both main tires blew, 4,000 feet down the 10,000 foot runway; the hook didn't grab the cable 600 feet from the end; the aircraft departed the runway, sheared the gear, wiped out an ILS antenna and came to rest 700 feet past the end of the runway. Both crew members egressed under their own power.

The investigation turned up (as usual) a number of contributors. Elimination of any one of these would have prevented this mishap. A broken throttle cable was discovered. The damage was caused by overtorquing which induced a fatigue failure. The T.O. was found to be in error when compared to the manufacturer's specifications and, when followed, would result in overtorquing.

Even though the part failed, there was an emergency procedure to cover this type of emergency. So we have to take a look at the pilots.

The front-seater was current in all aspects of the mission and considered well-qualified. The rear-seater was flying as a copilot because he had not met local standards even though he had successfully completed a formal IP upgrade course. Investigation of the crew coordination discussion du
the briefing revealed that
responsibilities during an airbor
emergency were not covered. E
though the problem was correct
analyzed, no one covered the
procedures.

The copilot stated he was goi
read the steps while the pilot
performed a 360, but the pilot
changed his mind and headed fo
straight-in.

The copilot assumed everythi
was under control.

There was an IP in the other
aircraft, and he assumed everytl
was under control.

The RSO was monitoring the
frequency and had informed the
of the problem. The SOF respor
with the correct emergency
procedure and told the RSO to p
it on but he didn't, assuming

LINK

erything was under control.
Instead of turning the fuel shutoff itch off when landing was sured, as the checklist stated, the ot shut off the throttle. The thrust the still running engine combined th the speed at touchdown caused chute to fail.

After the chute failed, the hook s lowered. The pilot's initial tement indicates that the first time thought about turning the fuel itoff switch off was after the hook s lowered.

The copilot did not use his shutoff itch in the event the pilot elected o-around.

Witnesses stated they saw puffs of oke coming from the tires, lowed by a steady stream of oke just before they blew.

Investigation revealed the antiskid itch was in the off position. The pilot had experienced antiskid failure on his previous ride and correctly identified it. He could not remember if he turned the antiskid switch off on purpose, thinking he again had antiskid failure, or if he reached for the fuel shutoff and turned off the antiskid switch. The antiskid switch is located in close proximity to the fuel shutoff switch.

A single reason could not be determined as to why the cable arrestment was not effective, but several problems were discovered.

■ A photo taken following the mishap revealed a definite sag in the cable.

■ The concrete cable housing was ⅜-inch higher than the asphalt, and this could have caused the hook to skip.

■ The cable could be raised or lowered by tower personnel from a slot in the runway. Taxi test showed that oscillations were set up by the gear passing over the cable.

Any one, or a combination of these problems, could have caused the hook to skip. There was a mark on the concrete and on the cable where it had been hit by the hook. The cable had to be low in the slot for this to happen.

As we look at this mishap we see problems with logistics in that the T.O. was in error; pilot error in not shutting down the engine as per the checklist; supervisory error in not passing the SOF's message to the pilot; and a support factor, the cable. Anywhere along this chain, a missing link would have prevented the mishap.

Learn and live! ■

It's monday morning, Judge

We invite you to join a mishap board in progress and evaluate their deliberations. At the end, you will be presented some questions designed to promote discussion directed at both aircrew and supervisory functions.

MAJOR LARRY D. REA
142 FIG (ANG)
Portland Intl Arpt, OR

INVESTIGATING OFFICER

■ Gentlemen, it's time for the daily review. Let's cover what we have learned about this mishap and determine what direction we should take in the investigation.

PILOT MEMBER

Considering a crew of five and the short time interval from takeoff, they were operating close to maximum gross weight. The search mission was being conducted at high density altitude. The performance charts indicate they were within the capabilities of the machine but very close to the top of the performance envelope. Any loss of engine power would have disastrous effects on lift production.

MAINTENANCE OFFICER

I agree. If the engine did malfunction, we will have an easy explanation for the uncommanded descent and crash. It won't take us long to finish this report.

The engine has been shipped for teardown analysis, but the reports won't be back for at least a week.

The preliminary indications are such that I suggest we assume no malfunctions and use this week to look for other probable causes to explain loss of lift. That way, the delay waiting for the teardown report won't be lost time if the engine is clean.

AERODYNAMIC ENGINEER

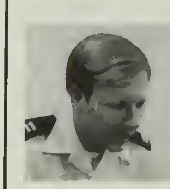
OK, let me dazzle you with some theory. Lift is created by the complex interrelationship of rotor rpm, rotor angle of attack, relative wind, and the effective lift area.

Assuming the simple condition of maximum engine power, an attempt to increase rotor angle of attack will result in loss of rotor rpm and a loss of lift. The relative wind then becomes the key to producing more lift. The pilot must dive the aircraft to increase airspeed/relative wind and thus increase lift.

At maximum power, a loss of headwind or a turn to downwind becomes a critical factor in lift production. In fact, a turn itself, as every pilot knows, reduces the area of effective lift and causes the aircraft to descend unless the loss of lift is compensated for in some Normally, that compensation is provided by more power or increased angle of attack. Howe we have seen that at maximum power the only option the pilot is to dive the aircraft.

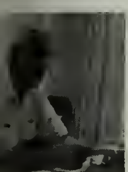
PILOT MEMBER

Loss of lift can be accounted in another way. Wind across rou terrain creates turbulence. The weatherman's analysis indicates surface winds could have created vertical velocities reaching 500 f per minute in the search area. A maximum power, the aircraft cou not cancel the effect of a downd If terrain clearance were not adequate a crash landing would b inevitable.



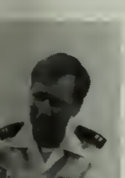
FLIGHT SURGEON

A factor to consider is pilot perception of increasing terrain height. Not only does it insidious reduce a safe clearance, but the t of the terrain could affect his perception of level flight and altitude requirements, leading to a judgment error.



INVESTIGATING OFFICER

Regulation establishes standard arch pattern airspeeds and terrain earance altitudes. Those quirements are designed to mpensate for most of these factors d give the aircraft some margin r safety.



FLIGHT SURGEON

Remember, the pilot was under essure to change the search ttern. A survivor who was able to lk out reported that badly injured rvivors remained at the crash site. e area he indicated for the crash e had been searched previously h no success. Since several days d elapsed, the whole search crew t a sense of urgency to locate the eckage.

To complicate things, the aircraft s painted white and had crashed snow covered, forested terrain. nite wreckage against white snow ovides little contrast and would be ficult to see. The aircraft mmander elected to solve these oblems by flying lower and slower give the observers more quisition time.

PILOT MEMBER

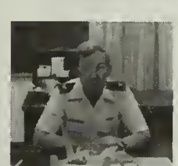
The regulation states that when circumstances warrant, modifying the search pattern is the aircraft commander's prerogative.

AERODYNAMICS ENGINEER

But, slowing down eliminated the power reserve for climb capability and descending eliminated the option of diving for recovery.

INVESTIGATING OFFICER

The decision to modify the search pattern was critical to the crash and is the key.



BOARD PRESIDENT

This analysis agrees closely to the testimony of the aircraft commander. He said they were proceeding up the canyon when the left observer spotted footprints in the snow. He lost visual contact and requested a left turn to reacquire the trail.

The turn was made toward the higher terrain of the canyon wall. The pilots noted the descent rate and increased power to the maximum. They attempted to arrest the descent by increasing the rotor angle of attack. The ''low rpm'' warning sounded followed shortly after by the rotor striking a tree. The aircraft then crashed to the ground resulting in its destruction and injury to the crew.

Gentlemen, I think we have a reasonable explanation for the crash even if the engine was performing as advertised. However, this type of explanation suggests some more questions.

1. Do we expect aircrew and supervisors to be this knowledgeable?
2. Have the supervisors provided proper control and training?
3. Does the flight manual adequately warn of the dangers present?
4. Are the crews adequately evaluated on their knowledge and ability to recognize conditions requiring maximum performance?

How are you, the reader going to answer those questions? ■

NEWS FOR CREWS

Career information and tips from the folks at Air Force Manpower and Personnel Center, Randolph AFB, TX.

CAPTAIN RANDY LUPOLT
Rated Supplemental Management Section

RATED SUPPLEMENT MANAGEMENT: What it means to the rated officer

■ In March 1978, we presented an article concerning the dynamics of the rated supplement. As a review, the key points of that article were that the supplement provides an immediate trained resource to augment or replace attrition in crew and staff requirements during contingency operations, and that the supplement consists of rated officers in the grades of lieutenant colonel and below serving in AFIT, PME and nonrated duties. With that in mind, let's turn to the subject of this article, today's management of the rated supplement and what that means to you.

The largest single factor which is affecting the management of the rated supplement today is a decreasing population of rated officers available to meet rated requirements. We just don't have the numbers of people we had a few years ago. Because of this, we've been decreasing the supplement size by returning most supplement officers to rated duty on their current supplement completion dates and by limiting new inputs. Most officers see this as contrary to their experiences in the early and mid-70's when a large supplement was developed, many officers were retained for extended supplement tours, and there was a great deal of opportunity for supplement entry. It's a significant change in management and it's going to continue for the foreseeable future.

The supplement inventory is projected to decline over the next few years until flying training production and the total rated force size reach a level which will maintain enough pilots and navigators to meet all of our rated requirements. This decline, or drawdown, is necessary to insure reasonable rated manning levels and to provide a career broadening opportunity to as many rated officers as possible during a period of shortages.

Since last March, the number of rated officers in nonrated duties has declined by about 2100 officers, from 6550 to 4450 at the end of June 1979. This decline is projected to continue at the same rate until the supplement size stabilizes at a level of around 3000 by the end of FY 80. Because the impact of this drawdown is being felt in all areas of the rated and support force, the management of this problem is not a matter to be worked solely by personnel.

In April of this year, a board of thirteen general of met at AFMPC and convened the Rated Supple Requirements Board (RSRB). The RSRB reviewe stated requirements for rated officers to serve in each port career field with inputs provided by each MAJ Air Staff functional manager, and the support caree manager at AFMPC. The RSRB identified a mini peacetime requirement for slightly less than 3000 officers to serve in support career areas on a sust basis. The board also recommended a specific distrib of the total by support AFSC. The majority of thes quirements are in research and development (R&D logistics, and at the precommissioning sources and faculties.

The officers who have entered the supplement ove last yew years – as well as the career fields they are ing in today – determine to some degree how we'll age each career area in the supplement over the next years, as we work toward the objectives of the R For most support career fields, there will be a lin capability for rated officers to enter until those curr assigned return to rated duty, are promoted to colon retire. For the areas mentioned in the foregoing paragr however, there is a need for increased inputs and capability for the currently assigned officers to extend

One of the most emotional and sensitive issues we to deal with today is the management of lieute colonels who entered the supplement during the big b up in the early 70's. Today this officer could represe great deal of experience and expertise in the support ca field to which he is assigned. Balancing that vested i est against our need for him in a rated AFSC is a challenge – one we take very seriously. Among the tors considered in reaching this decision are the offic retainability, his OER ratings, his job level, the c cality of current manning in his AFSC, his educati qualifications for the position, his weapon system b ground and flying currency, the need for rated in where he could be reassigned, and the proximity to consideration for promotion to colonel. Over the pa years, we've been tracking the decision-making in area, and in contrast to popular belief, over 40 percen the lieutenant colonels completing supplement tours

continued on pa

[The following describes an aggressive program pursued by a [b]ase which didn't fare too well during a Rex Riley visit last year. [W]e think it's a super approach to solving some problems!

[l]etter [t]o rex

Many times we become so primary mission oriented [w]e tend to treat our ancillary responsibilities lightly par[ti]cularly when there are no apparent difficulties. As [lo]ng standing Air Force members we also have a fierce [pr]ide in our ability and performance. On occasion our [bu]bble is burst by a subjective evaluation by an outsider [w]ho tells it like it is and has the benefit of comparative [an]alysis. It turned out that we were not as shiny as we [ha]d ourselves to believe. We were determined to bring our [le]vel of performance up to the highest possible stand[ar]ds. Our treatment and handling of transient aircrews [w]*ould* improve. This is important from two primary stand[po]ints; first, an aircrew in a good frame of mind is a [sa]fer one and next, transient aircrews are our guests and [sh]ould be treated accordingly.

Toward the goal of providing the best possible serv[ic]es within our resources, a transient aircrew services [pa]nel was formed to resolve problems and seek better [m]ethods. The panel is comprised of representatives from [tr]ansient alert, base operations, fuel management, com[m]unications, civil engineering, transportation, services [an]d weather. Those organizations not under our cog[ni]zance were asked to participate, which they did readily. [Th]is panel, which we feel may be somewhat unique, [m]eets monthly and is chaired by the airfield manager. The primary tool used to identify problems is the aircrew questionnaire. Problems are surfaced with an eye to taking corrective actions which endure. It became readily apparent that the majority of our solutions hinged on the attitude of the people with whom the aircrews come in contact. In these days of extremely tight budgets there was little which could be done in the way of improved facilities, and it turned out that little was needed. A good attitude and positive, helpful approach were generally the answer to most problems. Less than satisfactory remarks are normally investigated immediately before the trail becomes cold. In most cases a proper explanation is provided to the crew before they depart. Some situations require more indepth solutions and that is where the transient aircrew services panel is most effective.

The transient aircrew questionnaire is the most important tool available to improve services. This is a double-edged sword however, since positive as well as derogatory remarks are important. Very often those involved with providing transient services get little feedback on the results of their work. A pat on the back, if deserved, does wonders. On the other hand, well identified trouble areas can be better handled when sufficient information is provided.

The key to proper transient services is communication between those in the service business and those receiving the service. The transient aircrew questionnaire and the transient aircrew service panel provide the medium of communication to get the job done.

When Rex Riley gets to this base now he will recognize the difference that a combined effort toward providing good service can make. ■

4 BLUE NEWSLETTER

Aircraft Control Loss

■ One of the big players, along with collision with the ground, which has played a major role in increasing our destroyed aircraft rate and our pilot fatalities, is the pilot-induced control loss. Since January 1978, there have been 32 destroyed aircraft, resulting in 34 fatalities, where a pilot-induced control loss was involved. All types of aircraft have contributed to this accident trend. The majority, however, (all but seven of the 32) were fighter/attack aircraft.

Activities and aircraft break-out are as follows:

- Three trainers have been lost due to pilot-induced control loss. These mishaps all occurred in 1978. In two of the three, student pilots were on board without IPs. One of these occurred in the traffic pattern where the student pilot lost control attempting a go-around during the turn to final. In the second mishap, two students were aboard and they were apparently attempting some rolling maneuvers and dished out severely. In the third trainer mishap, a student pilot with an IP was demonstrating a new wrinkle to an old maneuver (Immelmann) and they both ended up ejecting when control was lost.
- Two cargo aircraft were lost because of control losses and in both of these, the aircraft was stalled in the traffic pattern. One was in weather on final, searching for a resupply field; the other was at night, turning base to final, also searching for a poorly lighted assault type runway. In both, the air speed was allowed to decay and control was lost. In both, the first action apparently was to raise the flaps when the pilot became aware that he was in trouble.
- Two observation aircraft, in 1978, also were lost due to control losses. In one, the pilot was attempting to locate a low level target for visual navigation purposes and allowed his aircraft to become slow, low, and stalled. In the second, the pilot had engaged in ad hoc ACT with another observation aircraft. He maneuvered his aircraft to a low altitude, high-angle-of-attack situation, and ejected when control was lost.
- One helicopter in 1978, on an actual SAR mission, was attempting to follow footprints in the snow at a low altitude over high terrain and slowed his aircraft to a point he no longer could maintain altitude. Vertical control was lost; he crashed attempting to move back toward lower terrain.
- One bomber, an EB-57, was lost this year when the pilot experienced pitot static malfunctions, which indicated a rapid increase in Mach and altitu He countered by reducing power extending flaps, speed brakes, ge and stalled. A spin was entered a the crew ejected.

As mentioned earlier, 25 fighter/attack aircraft have been

In most every instance a brisk reduction in alpha would have flown the aircraft out of the maneu before it progressed to a departure mode.

destroyed in the control loss mish resulting in 21 fatalities. In all bu two of these, aircraft control was lost at an altitude or attitude whic precluded recovery from the onse Fourteen of the 25 were engaged ACT, DACT, or BFM at the time the departure.

The heart of the control loss problem, then, in fighter/attack aircraft, concerns departures while maneuvering during air combat tactics training at an altitude belov that necessary for recovery. The trick is preventing departures – no concentrating on recovery. The fatalities associated with these typ of control losses attest to the fact

ıat the crews were trying to recover ıe aircraft when they should have een trying to eject. It was clear ·om our reports that the initial eparture symptoms were not ecognized by the crews who, with a igh adrenalin level, were in the full ill, kill mode. In most every ıstance a brisk reduction in alpha ould have flown the aircraft out of ıe maneuver before it progressed to full departure mode. But having aid that, the desire and motivation have, or not be had, may have een too fully developed in these olks for them to recognize that they ere even close to a departure tuation.

Some observation from our eports concerning air-to-air combat e as follows (control losses only):

- It is the defender over the ttacker, two-to-one. It is the less apable aircraft over the greater, our-to-one. If you have just been ad and reengage, your odds rise emarkably, and should there be an xercise in progress we all try arder.

Somewhat surprising is the fact ıat five of the aircraft which were ost, not engaged in air-to-air tactics combat, were single-ship, low-vel missions where the maneuver as at the choice of the pilot— not enerated by another thing. Photo connaissance aircraft were ıvolved in three of these. In one dditional control loss mishap, the lot was attempting to avoid a mulated SA-2. In another, the pilot as attempting to avoid a bird. In vo more— both F-15s— the pilots ad declared "lost wingman" in weather and lost control of their aircraft.

In all of the aircraft, regardless of type, it is basic that, when the angle-of-attack is increased to the point where the wing stalls, the aircraft will no longer fly. This can be done in two basic ways. Hold the G level and allow air speed to bleed off, or hold the air speed and increase your G level. In both cases, the yaw induced will couple aerodynamically to the pitch axis. The aircraft will also stall with negative alpha and exhibit the same loss of control symptoms as positive alpha stalls. The difference, of course, is that in the latter you are experiencing negative G with a canopy full of junk and you end up inverted. Abrupt maneuvers in either the yaw, roll, or pitch axes at critical positive angles-of-attack will almost assuredly result in a control loss of some kind.

Know the operational limits of your aircraft and its predeparture symptoms when it is near the stall angle-of-attack.

There are really just two approaches to avoiding departures.

- First, know the operational limits of your aircraft and second, you must know the predeparture symptoms of your aircraft when it is impossible to fly with your head in the cockpit. Burble, wing rock, nose rise, yaw excursion are those symptoms which most aircraft exhibit as they near the stall angle-of-attack.
- Know what your aircraft does and then heed those very subtle warnings and be sensitive and attentive to those warnings when they occur.
- Experience helps and to this end, feel your way out to the aircraft limits in a series of missions rather than trying to do the whole thing at once. Event proficiency is very important here. If you have not done the high alpha mission for awhile— ease into it.

Control loss mishaps have increased substantially in the past 2 years. We probably aren't having any more control losses than we ever did, but because of the altitude at which they occur, recovery is not possible. All the more reason to know exactly what your particular aircraft requires in terms of altitude, AGL, for recovery. When you are maneuvering at high angles-of-attack below that altitude, be extremely sensitive to those subtle warnings the aircraft will give you, even when you are in the full kill mode. ■

L/D back to basics

MAJOR NEAL R. MORRIS • 479th Tactical Training Wing • Holloman AFB, NM

■ Question: What do you call two instructor pilots flying in the same aircraft?

Answer: An accident looking for a place to happen.

Sound a little farfetched? Read on.

Two instructor pilots were flying from their home field to an auxiliary airfield to serve as the RSU controller for that day. The IP who was flying the aircraft from the left seat, began an idle power descent to position himself on an inside downwind.

Lowering the speed brake and the landing gear just prior to beginning his final turn, he noted the flaps were up and told his right seater that he would make a no-flap, idle power descent and landing. He rolled out on final slightly long and high and decreased his pitch to adjust to a no-flap approach angle. As he reached the desired glidepath, he increased his pitch to establish the proper approach angle. He then felt the aircraft begin to sink and noticed the airspeed rapidly decreasing through his desired airspeed. To arrest the sink, he lowered 50 percent flaps, moved the throttles to 100 percent and raised the speed brake.

As he applied back pressure, he felt a tickle. He relaxed back pressure slightly in an attempt to fly the aircraft at or near the tickle to obtain maximum performance. When it became apparent that the aircraft would land short, he applied more back pressure and stalled the aircraft short of the runway. The crew ground egressed safely, but the aircraft was destroyed.

Something that could happen to you? Never. Let's go over some of the events leading up to this mishap and look at it from your point of view.

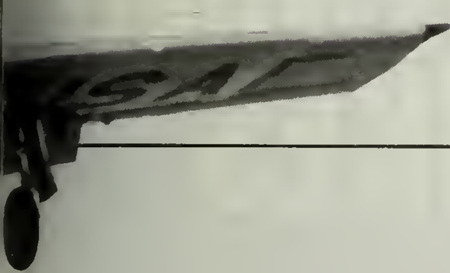
■ The instructor pilot flew an idle power descent and approach into an uncontrolled airfield.

Okay, sounds innocent enough. No need to ask why a "professional pilot" would elect to perform this maneuver, especially when there are no such training requirements. Perhaps he was preparing for his next stan/eval check. Besides, it was an uncontrolled airfield, and we all like to show our stuff when the "sup" is not around.

■ Shortly after rolling out on approach, the aircraft developed sink rate in conjunction with a ra loss of airspeed for undetermined reason(s). Most probably: (1) Increase in the angle of attack, ir combination with idle power and extended speed brake; (2) Windshear; (3) A combination of both.

Should this pilot have been surprised at the decrease in airspe when he raised the nose to increa the angle of attack? What should have he expected with an increase the angle of attack without an increase in thrust? Everyone know that you control the airspeed of a glider with the stick. Does a powered machine differ? Boy, wis I could remember all that aero cla from a few years back.

Windshear – horrors! Everyone knows this can be a problem, especially during the critical phase of roundout and touchdown. The weather warnings "always" flash through my mind just prior to each takeoff and landing. (During the



ollout on final approach? Well, I ust make sure I have what I want vhile I recheck my configuration nd runway alignment. Windshear is ot too important this high on final.)

■ The IP did not initiate a o-around.

This is not too difficult to deal vith. Really no need to go around. he landing can still be made. After all, what would the pilot in he right seat think of such a poor isplay of airmanship. Much better o demonstrate how good I really am vith this little bird.

■ The first pilot failed to take ction or provide assistance.

Now the troop in the right seat is eally up for grabs. He has observed his "unusual" display of skill from he start without any comment. He as great confidence in the other IP lying the aircraft. He observes the light path and observes that the irspeed is slightly . . . uh, 5 knots, o 10, no . . . uh, 30 knots below hat airspeed recommended by the dash one. He says nothing, believing that "old Joe" can hack it. I wonder how far he allows his students to go before taking corrective action.

■ The IP lowered 50 percent flaps to arrest the sink rate.

What can we say here? Back to the aero classes. Yes, lowering flaps will decrease your stall speed. Yes, lowering flaps will decrease touchdown speed, decrease landing roll, require more thrust, etc. Will it increase your airborne distance? If so, why not use half flaps to fly cross-country? The answer should be obvious. Lowering flaps one-half or full will decrease glide distance.

Consider a no-power approach. What do you do if you are going to be long? Solution: lower flaps to increase drag. Maintaining L/D max is the way to obtain the maximum glide distance. Looks like our friend may have his basic aero principles confused.

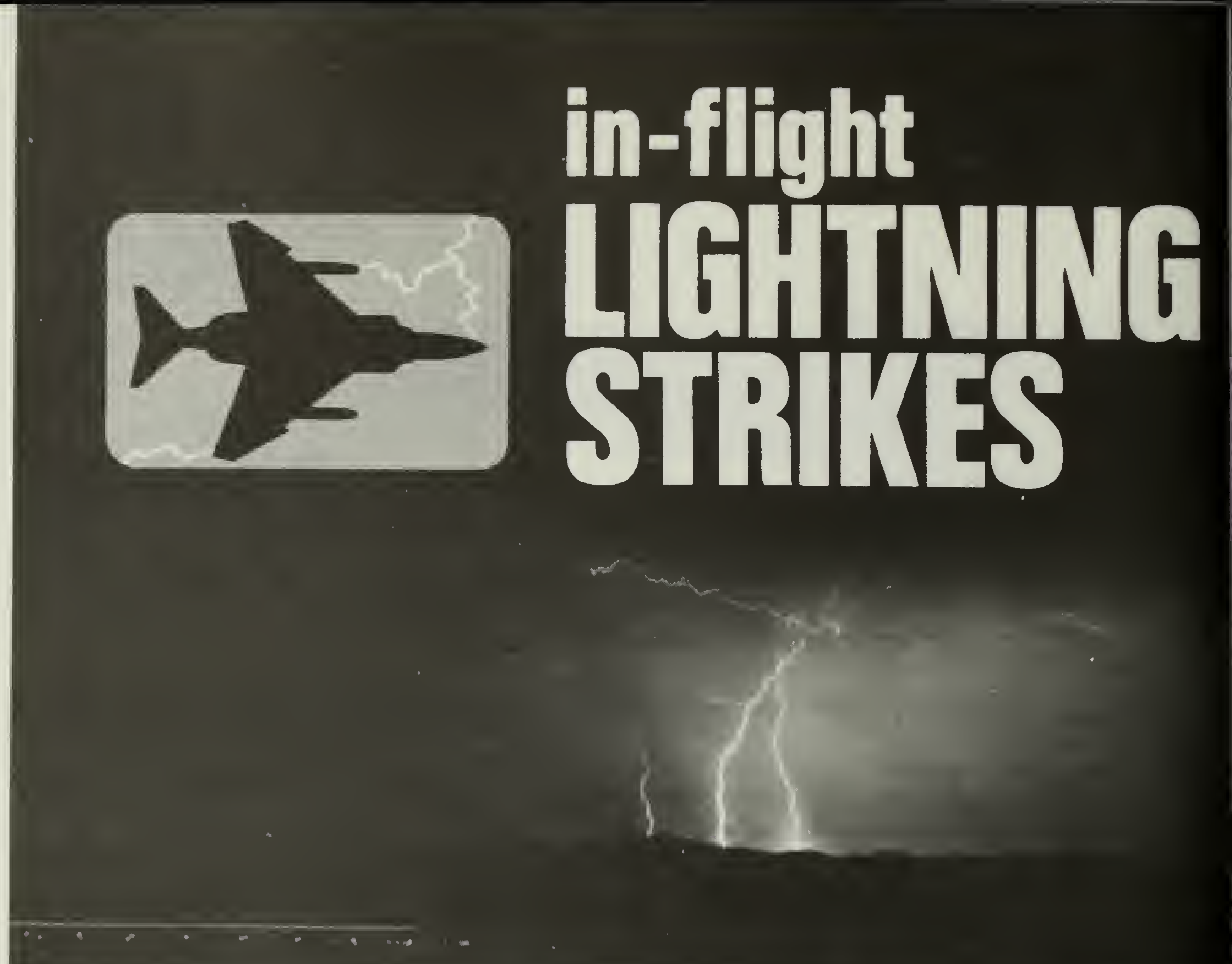
■ The IP delayed adding power and raising the speed brake until the aircraft approached a stall.

■ He continued to fly the aircraft in the region of reverse command.

■ The IP stalled the aircraft just prior to impact.

Do these last three items sound a little familiar? Seems like I remember a movie about those things. Something about a "Sabre Dance." I thought that stuff was just for the F-100. Well, no matter. I know what my machine can do as well as I know what I can do. You will never catch me making any of those dumb mistakes. I have to go now; I have a bet on my gunnery flight for this afternoon. ■

in-flight LIGHTNING STRIKES



■ One of the most feared phenomena associated with thunderstorm activity is lightning. An awesome force to behold from the ground, it commands even greater respect in flight. Fortunately, most lightning strikes do not cause serious aircraft damage. In fact, many go unnoticed until the small attachment scar or pitting become evident during a casual exterior inspection several weeks later. A General Electric study of over 200 aircraft lightning strikes revealed that 78 reported no effects on the aircraft, 32 had some degree of radome damage, 40 involved interference or damage to instruments, 27 had static discharger damage and only 27 resulted in holes burned or skin panels damaged.

Lightning occurs when one highly charged area of the atmosphere discharges into another. Circumstances for this discharge exist during heavy rain or thunderstorm conditions. Rapidly developing rain clouds become positively charged at the top and negatively charged at the base while the earth's surface generally maintains a positive charge. As convective action builds, the charge intensities increase until a discharge of lightning occurs between the charged surfaces of the same cloud or between two clouds or between a cloud and the ground.

The lightning charge itself begins with a "stepped leader" or faintly luminous path of ionized gas about 150 feet in length emanating from the cloud or charge center. The "stepped leader" twists and turns to avoid atmospheric resistance and accelerates ionization in the air to the point that luminous ribbons or "positive streamers" similar to the stepped leader grow from the ground or opposite charge center. As a positive streamer contacts a stepped leader, a conductive path is established and a tremendous surge of electrons instantly drains the charge. It is estimated that three s surges or strokes occur with each bolt of lightning, however, as mar as 14 strokes per bolt is not unusu Lightning studies suggest an avera distance between a cloud's charge centers of nearly 4 miles; however charge distances between different clouds can well exceed this.

Most lightning strikes occur nea convective activity where thunderstorms may or may not be present. The General Electric stud revealed the following conditions during strikes:

- 96 percent occurred at altitude below 25,000 feet, 4 percent betw 33- and 37,000 feet.
- 88 percent occurred during precipitation.
- 84 percent happened to aircraf within clouds.
- 81 percent involved reported turbulence.
- In 68 percent the aircraft was

COL GEORGE J. BIFOLCHI
ectorate of Aerospace Safety

ther climbing, descending or on proach when struck.

■ In half the incidents, electrical tivity or nearby lightning strikes ere evident *before* the strike.

In summary, the majority of ikes took place in a cloud, during ecipitation and light turbulence, mbing or descending at 250 knots tween 10- and 12,000 feet with the tside air temperature near the ezing point.

The effect of an in-flight lightning ike can vary from a tiny molten rface scar or puddle to a complete elt-through of aircraft skin. If it ters an aircraft fuel tank, it can adily ignite explosive mixtures thin, perhaps destroying the craft. Lightning also introduces the direct effects of electromagnetic upling which can severely damage ernal aircraft electronic equipment. rrent technology, low power, croelectronic circuits, for example, particularly vulnerable to htning induced current surges. w aircraft employ these circuits in ny critical systems such as flight ntrols, electrical power distribution d weapons management consoles. Electromagnetic coupling is made sier through the increased use of nmetallic or composite structures. ithout the protection of a metallic terior acting as a "Faraday Cage," htning is easily permitted to enter aircraft interior.

Aircraft fuel systems are also lnerable to lightning. In a recent nsport mishap, a lightning melt-ough on the wing caused a main l tank to explode— destroying the craft. Fuel vent systems present problem of protecting fuel effluents from lightning ignition as they leave the aricraft. It is also difficult to devise flame arrestors which can deal effectively with high-speed flame propagation in the vent ducts.

The chart shows statistics for the period 1 January 1977 to 30 April 1979, which give some idea of the relative expense associated with in-flight lightning damage:

Aircraft	No of Strikes	Dollar Loss	Cost Per Flying Hour
F/FB-111A	15*	15,445,092	77.08
C-130E	35*	3,667,298	4.58
KC-135Q	14**	332,592	.53
F-4	19	116,420	.12
T-39	3	7,914	.03
C-141	4	1,109	.0016
C-5	1	6,180	.05
A-7	3	—	—

*(1 destroyed)
**(1 Class A)

Several locations on an aircraft are prominently susceptible to lightning strikes; the wing tips and ailerons, antennas, vertical stabilizers, and nose radomes. Although it seems incongruous that nonconductive radomes should be struck by lightning, these strikes occur because metallic components beneath the radome send out streamers which meet an approaching stepped leader. If the strike intensity is sufficient to explode the air within, the radome can be severely damaged.

Antennas often provide the means for lightning to enter the cabin, endangering personnel and equipment. Lightning arrestors built into the antenna system are a typical means of protection from this hazard. With aircraft flight controls the problem is one of current transfer between fixed and removable surfaces. Bonding jumpers can be installed to facilitate this transfer. Control surfaces should be carefully inspected if they were possibly struck by lightning.

Another by-product of a lightning strike is magnetism. Because of the intense field associated with lightning, ferrous metals on the aircraft become magnetized. Of particular concern regarding this effect are magnetic compasses. Following a strike, ferrous metal components should be checked for magnetic effects and if appropriate, degaussed to remove them.

Reducing the risk of a lightning strike is a difficult prospect for today's aviator, particularly in a tightly controlled air traffic environment. While improvements in aircraft design and construction increase their resistance to strikes, the key to safety continues to be lightning avoidance through knowledge of the hazard, resourceful planning, and timely alternatives. ■

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THE PROFESSIONAL APPROACH

Air Force Communications Service
Scott AFB, IL

■ Aircrew members have noted that some DOD FLIP En Route Supplements have become unmanageable in flight due to the thickness of the product. One of the primary reasons for this unwelcome growth is that many aerodrome remarks normally designed to depict pertinent data required for en route use have become lengthy with miscellaneous information. Furthermore, the continued growth has resulted in yearly budget increases in the production, printing, binding, and transportation of the products.

In FY 79 the DOD FLIP budget was over $7 million dollars, and with the increased cost of paper and printing, this figure could rise even higher if FLIP managers at all levels do not take steps to reduce costs. There is a program underway to reduce the size of the US IFR Supplement. HQ USAF/XOOTF has directed HQ AFCS/FFOS to review the aerodrome remarks for each CONUS Air Force and Air National Guard activity for the purpose of retaining data pertinent for inflight, enroute use and remove data which does not meet the established criteria that appears in the legend of IFR Supplement-US, page 8.

Some of the information to be removed can be classified as "Flight Planning" information and will be relocated in AP/1, AP/2 or AP/3 under a new entry title "Supplementary Aerodrome Remarks." Specifically, this additional entry will accommodate the supplementary aerodrome remarks, as well as flight hazards and route and areas restrictions applicable to the aerodrome. This combination will relieve the planning data for that aerodrome.

The entries titled "Flight Hazards" and "Routes and Area Restrictions" will be retained to accommodate areas not affiliated with an aerodrome, "Lake Mattamuskeet and Pungo Lake" on p 3-15 AP/1.

There are steps we can take to decrease the of FLIPs:

1. At the base level, FLIP users can periodi review their requirement to ensure they are not o ing more products than they actually need.

2. All agencies authorized to submit inputs inclusion in FLIP products should take a hard to ensure the information is actually needed for o ational use, and the information not required for planning or en route use, labeled as "nice to kn is not included in the requests.

Other FLIP improvement programs are under Emphasis will be on flight safety and costs savi You can be assured the quality of pertinent infor tion will not be sacrificed; however, it is the respo bility of the aircrew member to know where to for appropriate information. In short, don't forge check the General and Area Planning publicat before jumping off into the blue.

In the past, several units have had proble receiving their FLIP products on time. In addit some have had problems receiving the correct n ber. If you are not receiving the correct numbe publications or receiving them late, check with y local FLIP account manager to verify you are correct distribution. If this does not provide solutions, have your FLIP manager notify DMA GADMS, St Louis, MO, by message or teleph AUTOVON 693-8387 or commercial 314-2 8387 ■

OPS topics

affic Info

A recent HATR ad-
essed the requirement for
traffic controllers to
ue traffic advisories. A
view may be in order.
e issuance of traffic in-
mation is an additional
vice on the part of the
ntroller. The air traffic
ntrol handbook instructs
ntrollers, "Provide
ditional services to the
ent possible contingent
ly upon your capability
fit it into the perform-
ce of higher priority
ies. . . . The provision
additional services is
t optional on the part
the controller, but rather
equired, when the work
uation permits." Re-
mber, controllers have
mplete discretion for
ermining if they are
e to provide or continue
provide the service in
h case. Their reason not
provide a service in a
ticular case is not sub-
t to question by the pilot
d need not be made
own to him. – Maj
eph R. Yadouga, Di-
ctorate of Aerospace
fety.

Air Force Chief of Staff General Lew Allen, Jr., presents the Cheney Award for heroism to Captain Christopher C. Soto in a Pentagon ceremony. (U.S. Air Force photo)

Cheney Award

Captain Christopher C. Soto, an EWO in the 35th Tactical Fighter Wing, George AFB, CA, has received the Cheney Award for heroism. The award was based on Captain Soto's action in pulling his pilot to safety after their F-105G crashed on take-off. Captain Soto had escaped when he saw the pilot was trapped in the burning aircraft. He rushed back, opened the canopy and assisted the pilot to safety.

Aero Club Mishap

Pilots of military aircraft flying high speed, low-level missions are not the only ones fooled by rising terrain. An aero clubber was a recent victim. While on a cross-country, in mountains with rising terrain, the pilot did not realize that the ground was rising faster than the aircraft. The application of full power could not provide enough gain in altitude so the pilot landed in an open area. The landing was successful until the nose wheel dug into mud and the aircraft flipped onto its back. Both the pilot and his passenger escaped uninjured and probably much wiser.

Up And Out—Fast!

How well do you know your emergency ground egress procedures? Have you switched aircraft types or ejection seats lately? If your aircraft caught fire on the ground today, could you get out safely in minimum time?

All are simple questions that should be easy to answer, but be honest – it's your life! Each year approximately 25 aircrew members are faced with an emergency ground egress situation. Most of them are successful in evading serious injury, but occasionally the heat and flames have caused individuals to revert to old habit patterns, and the results have been fatal. Do you have your current procedures down cold? Do you actively practice them? If so, you are upping your chances, of surviving and escaping an aircraft fire – Maj Wm Harrison, Directorate of Aerospace Safety.

OPS topics

continued

Canyons Have Cables

Canyons seem to have a fascination for most people. That's fine – unless that fascination leads a pilot down the garden path to destruction.

Just such a tragedy occurred recently when a young pilot flew his aircraft into a canyon and struck a pair of heavy cables spanning the canyon. As has been demonstrated countless times – with both military and civilain aircraft – in a tangle with large cables the aircraft will always lose. In this case, the pilot went in with the airplane. No use moralizing. He made a bad bet and paid the supreme price for losing.

Lightning

F-111 mishap aircraft was on the wing after takeoff. Passing 6,000′, the flight entered clouds, and number 2 received a severe lightning strike to the radome. The crew had some erroneous airspeed indications but hung in there and landed at an alternate on the wing. Good job! It's still that time of year.

Near Hit

A recent near miss emphasizes that even a vigilant crew might not see another aircraft in its vicinity.

An RF number one on final spotted a light aircraft nearby and warned number two. Two turned final, but the crew did not see the light plane until they rolled level. There he was – about 300 feet away. The aircraft had violated the base control zone by crossing the final approach at 2,500 feet.

Watch That Leak!

About the halfway point of an overwater leg, the loadmaster found a pool of hydraulic fluid under some aircraft start carts. Aircraft continued on to destination and carts were downloaded. No leak could be specifically located, even after everything sat on the ramp for 3 days. Climbs, descents or pressure changes could cause some phantom leaks! Good case for extra vigilance over cargo in flight!

Ejection Seat "Safe"

When the pilot pu the pin prior to take he noticed he had the – the T-handle – and v appeared to be the j however, close scru revealed that the pin just the insert and that outer sleeve had remai in the seat. Under this c dition, the seat was safed and would not h fired during an eject attempt.

Finding: The pin l been in use for an un termined length of ti and apparently the ou sleeve had failed inside T-handle due to fatigue.

Lesson: A positive vis check of all safety pin movals increases the pr ability of a successful em gency ejection. – C Mike Fowler, Director of Aerospace Safety.

Dropped Objects

We've noticed a f messages regardi dropped objects. This m be a good opportunity think about the procedu involved. Supervisors – the throttle-benders kn "who, what, when a where" if something fa off their machine wh airborne? Check it out!

t Down or Press On?

▪ While in contact with proach control, the helipter crew was informed at the weather forecast is not holding up and that nditions were deterioing rapidly due to a fast oving cold front. Nine les from the airport, the ot requested radar vecrs, and, at 6 miles, he cided that he could not ay clear of clouds and ake the field. He mainned VFR, informed the wer of his intentions, and nded in an open area bere the storm passed, 45 nutes later, the crew took f and continued on their y.

▪ The flight of two helipters was an IFR derture from a cross-coun- refueling point. Five les southwest of the airrt they were instructed to oceed on course and ked by Center if they ere IFR or VFR. The d replied, "VFR." The ght was then observed radar to descend from 00 feet MSL to 1100 et MSL, which placed em approximately 300 et AGL. Sometime later e helos were observed be about 10 and 35 feet ove the trees, respecely, trying to fly VFR in IC. Within 2 miles, the d flew into the side of a cliff, without altering course or attitude. Everyone aboard was killed. The wingman attempted to turn away but stuck his tail rotor in the trees. The crew chief was killed.

These are actual examples. No elaboration is needed. Helicopters have the unique capability to land in any clear area. However, since we are all-weather pilots with all-weather aircraft, too often we have been reluctant to exercise this option. Trying to maintain VFR flight, in conditions which are not suitable, has cost many lives and helicopters over the years. There is no rational reason for staying in the air when you can't see anything and are not flying IFR. In fact, it's quite stupid. — Courtesy USN *Weekly Summary.* ■

NEWS FOR CREWS

continued from page 12

extended due to one or more of the considerations mentioned above.

For those of you currently in rated duties who have interest in supplement opportunities, between now and the end of FY80, we need approximately 300 rated officers in the following areas: aircraft maintenance, munitions maintenance, field training detachment commanders, acquisition program management, development engineering, research and analysis, civil engineering and instructor or staff duty at Officer Training School, Squadron Officer School, Air Command and Staff College, Air War College, Reserve Officer Training Corps detachments, and the Air Force Academy. If you have qualifications and interest for assignments to any of these areas, give us a call — if you can be released, there's still plenty of opportunity and a variety of jobs available.

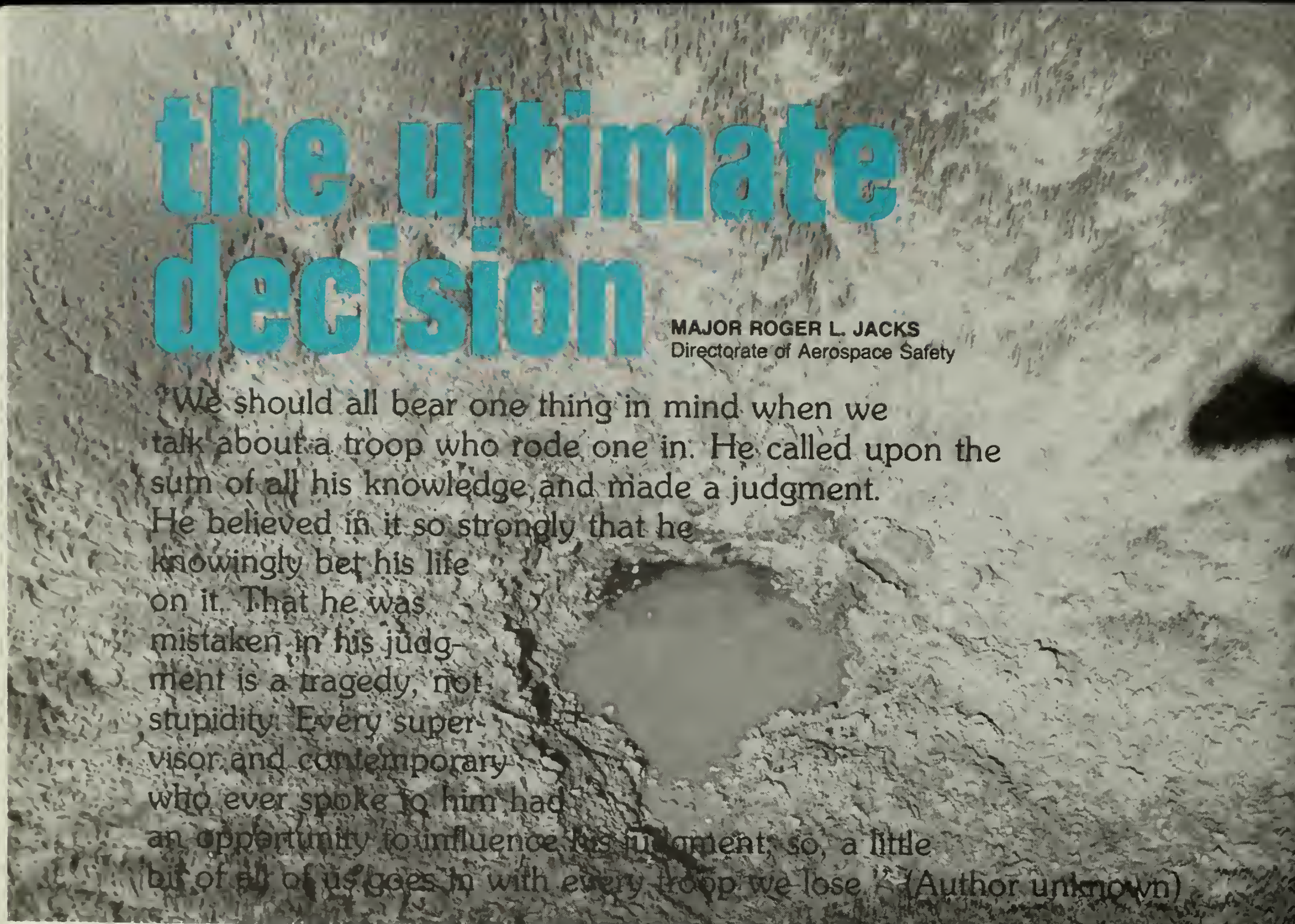
In summary, the supplement will be reduced in size considerably over the next few years to meet Air Force operational commitments. This drawdown will affect the future assignments and career development patterns of many rated officers. We're working this drawdown on an individual basis to maintain the optimum balance between the needs of the Air Force and the desires of the individual involved. At the same time, ample opportunities for career development in selected supplement areas will continue to be available for those who are releasable, qualified, and interested. ■

ABOUT THE AUTHOR

Captain Randy Lupolt has been assigned to the Air Force Manpower and Personnel Center as an action officer in the Rated Officer Career Management Branch since January 1977. After graduation from Wittenberg University, Captain Lupolt flew as a B-52 radar navigator at Fairchild AFB and Anderson AFB, Guam. ■

F-102 Pilots

A reunion is planned for November 9th and 10th at Sheppard AFB, TX, in conjunction with dedication of a pedestal mounted F-102 aircraft. Anyone interested contact: Col John M. Franklin, 4300 Shady Lane, Wichita Falls, TX 76309, phone (817) 692-6081.



the ultimate decision

MAJOR ROGER L. JACKS
Directorate of Aerospace Safety

"We should all bear one thing in mind when we talk about a troop who rode one in. He called upon the sum of all his knowledge and made a judgment. He believed in it so strongly that he knowingly bet his life on it. That he was mistaken in his judgment is a tragedy, not stupidity. Every supervisor and contemporary who ever spoke to him had an opportunity to influence his judgment, so, a little bit of all of us goes in with every troop we lose." (Author unknown)

■ We've been losing our friends and fellow fliers at an alarming rate. As of June this year, our aircrew fatality rate represented the worst loss of life per 100,000 hours of flying time since 1959. The frustrating aspect of this grim statistic is that there is no readily apparent solution. We know most of the mishaps are human factor related. Material failures are at a comparable rate with previous years; but human factor mishaps are going wild.

I have heard a lot of reasons given for the high fatality rate, such things as inexperienced crews, a lack of qualified instructors, mass exodus of pilots, poor and/or inexperienced supervision, too many additional duties, poor scheduling, inadequate training, not enough flying time, more demanding missions, crew overloading and realistic training scenarios such as Red Flag. A lot of these are valid problems and staff agencies at all levels of the Air Force are actively seeking a solution. But let's discuss some things the crew member can do now to raise the odds against being "a troop who rode one in."

In anything we try, attitude, knowledge and ability are the key factors. The flying game is no exception. Attitude (or motivation) is probably the most important factor, followed by knowledge and ability which we can translate into experience. During a typical tour in a weapon system, a crew member's motivation and experience levels usually demonstrate some dynamic changes. During initial checkout, one studies hard to learn the new job. Although experience level is low, motivation is high. By the time he is operationally qualified, his confidence factor is high and he is quite capable of handling the basic mission and straightforward emergencies. His experience level, however, is still relatively low. prudent crew member in this situation would be aggressive wh keeping in mind his limited experience.

It's easy to overextend yoursel when you're trying to establish yourself as a top notch crew member. To be the best, we mus aggressive, but also realistic abo our abilities and use our judgmen and common sense to keep a che on runaway pride or an inflating ego.

After a couple of years experience, it's easy to look back those earlier days and realize just how limited our skill level really was during that initial qualificatio period.

Most of us are at our best duri the two-to-five year period. Experience levels are high and so motivation as crew members in th bracket are competing for instruct

raining missions are successful only if ney produce mission-ready aircraft and rews. Smoking craters do neither, not to nention the most important aspect—the oss of our friends and fellow fliers.

ots, flight leads, standboard and her leadership positions. After the ur-or-five year point, however, me crew members' motivation ay begin deteriorating and mplacency may start to show its ly head. It is easy at this point to ke on an attitude that all of the periences of an old head will get a y through a future sticky uation. Will it? Don't bet your e on it!

Each year we have mishaps where old faithful work horse manages dazzle the crew by providing em a mind boggling, hair raising perience. It always amazes me at an aircraft can be in the ventory for 10 years or better and still discover things about the stem we didn't know. Often it kes a new, inquisitive guy ecking out in the aircraft to scover the oddity; or, sometimes it fortunately takes a costly mishap. p service to studying aircraft ocedures won't hack it. No matter w much time one has in an craft, it's essential to routinely hit e books!

After studying the dash one and, particular, the emergency ocedures, it's smart to sit back d think about making that decision when to abandon the aircraft. entally review possible egress uations and how procedures ange as the aircraft transitions om one flight profile to another. ke a look at decision timing when tted against absolute altitude, speeds, sink rates, vertical locities and bank angles. In our w aircraft we have the best escape systems ever and yet far too many crews are not getting out. Why?

The answer may be linked to the mission. Tactics have dictated edge of the performance envelope maneuvering as well as extremely low flight profiles. With tactics such as these, the new escape systems are not as reassuring. Edge of the envelope ejections with seconds to make key life-saving decisions become overriding factors.

Under these circumstances, we need a good game plan to ensure survival. It's easy to develop tunnel vision and focus all of our attention on saving an aircraft that, in reality, is an impossible task. Situational awareness, along with a game plan that dictates a cut-off point where saving the aircraft is abandoned and saving ol' Ish becomes paramount, is essential. In a multiposition aircraft, it is important that the crew get together and discuss aircraft egress decisions.

Thorough, proper training is all important. In these days of limited budgets and minimum flying hours, last minute pencil whipping of quarterly requirements doesn't get it. We have to get all the practice we can and make every effort to get the training in a timely recurring fashion (event scheduling). If the scheduling system doesn't work the way that it should, we need to tell the squadron and wing chain of command. We can't settle for inadequate and poorly timed training. With the emphasis on realistic exercises, such as Red Flag, we can't afford to short change ourselves.

Especially for the newer troops: don't intentionally exceed your ability in an effort to save your pride or feed your ego. In a training environment it's better to ''live to fight another day.'' Training missions should be used as learning tools, not as a life or death battle.

I'm not telling you to scuttle the mission for safety. I am saying that training missions are just that, training! It's easy to get carried away and attach tremendous importance to the mission. Sure, training missions are important but for different reasons than mission accomplishment, no matter what. They are for practicing, for developing experienced crews (old heads if you will), for checking out aircraft and systems and determining system reliabilities.

Training missions are successful only if they produce mission-ready aircraft and crews. Smoking craters do neither, not to mention the most important aspect— the loss of our friends and fellow fliers. ■

SURVIVAL Survival Equipment
(OPEN WATER ENVIRONMENT)

TSGT CHARLES W. LOVELADY | Operations & Requirements Branch
3636th Combat Crew Training Wing
Fairchild AFB, WA

Recently, we received a phone call from a captain stationed at Barksdale AFB, LA, congratulating us on the articles appearing in this magazine. During the course of our conversation, the topic of sea survival arose and the captain asked about the possibility of our doing an article on equipment for *Aerospace Safety*. Well, captain, here goes it.

■ The chances for overwater emergencies are high considering that four-fifths of the earth's surface is covered by water! And experience tells us that some aircrew members will succumb needlessly to the hands of the open seas. In order to give you a better handle on some sea survival tidbits, let's review some of the primary pieces of equipment that can save an aircrew member's life.

One primary piece of equipment is the life preserver. There are two basic types in the Air Force inventory and both are actuated in the same manner. The primary difference is that one has a harness of its own, while the other is attached directly to parachute harness by zippers and tie strings. To properly fit the life preserver, put it on like a coat or vest (see Figure 2). Adjust the flotation cell container so it is as high as possible under the armpit and still comfortable. The waist strap should adjusted to fit snugly. If you are sure as to which type of life preser you have or have questions conce ing proper adjustment, don't hesit to ask your local life support peop At this point you should ask yours "Do I know how to inflate the p server?" Remember, you are pr vided the best possible equipme however, it does you no good if isn't used properly.

The next piece of equipment the raft, of which there are curren four basic types in the Air Force i ventory: one, seven, twenty, a twenty-five man.

The primary raft for ejection se type aircraft is the one-man. The are four variations of this raft (s Figure 3). The newer version i corporates an inflatable spray shie and floor which provide protecti from the elements.

The raft for multi-place aircra will either be the seven, twenty twenty-five man raft. The accesso kits aboard these rafts will conta a variety of survival equipment. T.O 14S1-3-51 outlines the mandator equipment that will be packed in th kits. Local units may add addition items to the accessory kits depende upon the mission requirements.

Do you remember how to boar

FIGURE 1

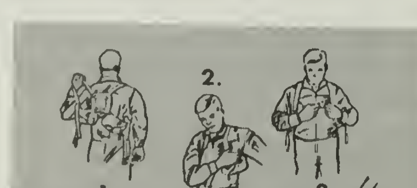


FIGURE 2

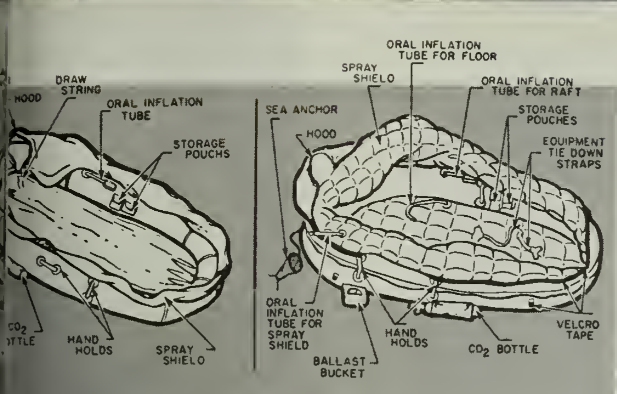


FIGURE 3

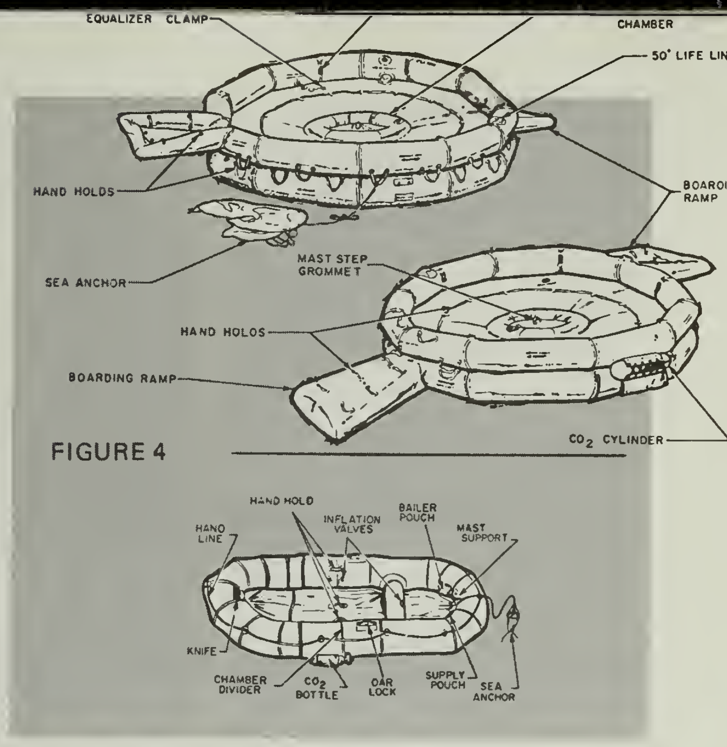


FIGURE 4

:se rafts? If not, be sure to check th your local life support personnel. our life may depend on it.

Perhaps the greatest single threat survival at sea is exposure, which counts for the greatest number of talities. Figure 5 indicates how ng the average crew member could pect to survive in the water wearing ly a flight suit. Wearing of an anti-posure suit doubles the survivor's e expectancy. The suit is designed protect the wearer while immersed cold water and from wind, spray, d rain when adrift in a raft. Be sure check the suit for proper fit to in-ide water tightness.

After climbing safely aboard your t, other problems of basic survival gin, problems of food, water, shel-, etc. Sea survival is unique; water erywhere but none to drink. True, ere is a shortage of potable water; wever, you will find some canned ater in the raft accessory kits for mediate use and some devices that ay be used to procure drinkable ater during your stay in the raft. ese devices are the solar still and e desalter kit. Instructions for using ese devices are provided in the kit. ne word of advice: no matter how irsty you are, *never drink sea ater!* If you do, dehydration and/or electrolyte imbalance of body ids could occur and cause death.

The aircrew member who is thor-ghly familiar with the principles of rvival and the life support equip-ent provided for his use is more ely to survive in an emergency. ■

Time of life expectancy in water with no exposure suit

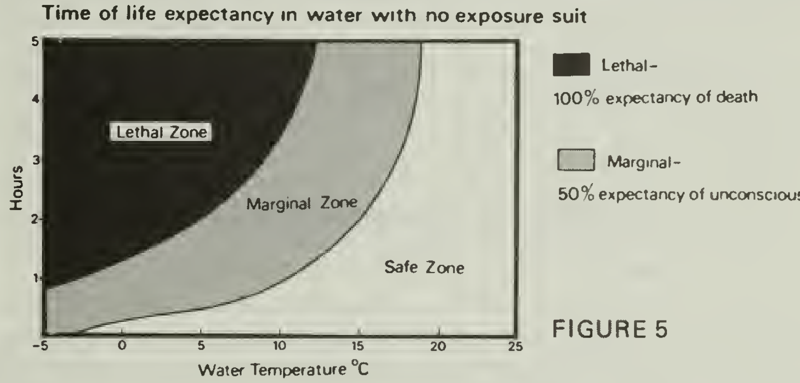


FIGURE 5

CAN YOU PASS THIS TEST?

1. What survival equipment is carried aboard my aircraft?
2. Where is the equipment located?
3. How is it deployed?
4. If the equipment malfunctions, how do I correct it? If you're not sure about the answers to any of these questions, check with your life support personnel.

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MAIL & MISCELLANEOUS

TWO "OLD PRO'S"

■ "Friday the 13th" (of April 1979) was anything but an unlucky day for Lieutenant Colonel Doyle D. Baker, Assistant Director of Operations of the 343rd Tactical Fighter Group at Elmendorf AFB, Alaska. On that day, he flew his 4000th hour in an F-4.

Colonel Baker started flying F-4s in the early 1960's as a U.S. Marine pilot at MCAS El Toro, California. He was to fly 75 combat missions from Da Nang AB, Vietnam, but it was exchange duty with the Air Force in 1966 which proved to be the turning point in his career. Assigned to the 16th TFS, he returned to combat duty at Udorn RTAB, Thailand. Here his combat mision totals went over 220, with some 100 over North Vietnam. On 16 December 1967, he became the first Marine pilot to down an enemy MIG-17 in aerial combat. In September 1969, the colonel made an interservice transfer to the Air Force and has since enjoyed a career as distinguished as his earlier Marine Corps service.

During this historic flight, there were actually two "Old Pro's" in the air—Colonel Baker and F-4E 67-208. The officer's military career began in 1961, the airplane's in 1968. On the flight in which the colonel passed 4000 hours, the airplane passed 5000. —Adapted from *Product Support Digest,* Vol 26, No 3, 1979, McDonnell Aircraft Company.

MARIJUANA (*Aerospace Safety,* May 1979)

Mr. Stanton, publisher of *Executive Health*, informed me he gave permission for my late husband's article on marijuana, to be reprinted in *Aerospace*. I am delighted as such information needs exposure.

Our book *Sensual Drugs: Deprivation and Rehabilitation of the Mind* was reviewed by Dr. Powell in the second half of the *Executive Health* article which wasn't printed in *Aerospace*. It is an especially informative book and the only one of its kind. It grew out of ten years of Dr. Jones' experience in presen[ting] the facts about psychoactive d[rugs] to undergraduates at the Unive[rsity] of California, Berkeley. It is a [good] source for the layman and studen[t on] the effects of marijuana (and o[ther] psychoactive drugs) on the brain [and] the body.

Thank you again for your inte[rest] in the marijuana problem and the printing of Dr. Jones' article in *Ae[ro]space.*

Helen C. Jones
2315 Durant Avenue
Berkeley, CA 94705

THE LIFE YOU SAVE . . .

We strive for involvement in our Flying Safety meetings. For this reason we requested that members of the 74th Aeromedical Evacuation Squadron provide a demonstration of the Heimlich Method, Anti-Choking Maneuver at one of our meetings. An explanation of the basic maneuver and its proper execution was followed by a question and answer period. Few of us present thought we've ever be tested on the subject matter.

On Friday evening, March 30, 1979, members of the 901st Aerial Port Squadron were seated on a C-130 as it started engines in preparation for a weekend UTA deployment to Pope AFB, NC. One of these members, TSgt Garth O. Parker, was finishing up a submarine sandwich prior to departure. Without warning, Sgt Parker suddenly lost his ability to breathe as a portion of the sandwich lodged in his throat. The sounds of Sgt Parker gasping for air could be heard over the roar of the C-130 engines. TSgt Ronald Ploof, seated [next] to Sgt Parker, responded immedia[tely] to the crisis. He applied the Heim[lich] maneuver three successive ti[mes] without success. On the fourth [at]tempt he dislodged the sandwich [and] Sgt Parker once again had a re[ady] source of air.

Had Sgt Ploof received special l[ife] saving training that allowed him [to] act so quickly? No! He had seen [the] Heimlich Method demonstrated tw[ice] previously, but one of those occasi[ons] was two months prior, at the mont[hly] Flying Safety Meeting. His magnific[ent] response to a critical emergency [re]flects great credit upon himself. [But] it also demonstrates, quite emph[at]ically, the benefits of effective traini[ng] programs. Our hats are off to TS[gt] Ron Ploof for his life-saving effort a[nd] to Capt Harris and Lt Riccio, 74AE[S] for a class well taught.

Robert T. Martens, Capt, USAFR
Flying Safety Officer
439th Tactical Airlift Wing (AFRES)
Westover AFB, MA ■

☆U.S. Government Printing Office. 1979—683-011/

STATES AIR FORCE

Well Done Award

…ented for …nding airmanship …d professional …rmance during …rdous situation …and for a …nt contribution to the … States Air Force …dent Prevention Program.

CAPTAIN

Stephen C. Gillette

CAPTAIN

James W. Delk

307th Tactical Fighter Squadron
Homestead Air Force Base, Florida

■ On 29 November 1978 Captain Gillette and Lieutenant Delk were leading a two-ship ground attack mission in an F-4E aircraft. During target egress at 500 feet, the aircraft hit a turkey vulture which penetrated the left windscreen quarter panel. As a result of impact forces on the emergency canopy jettison handle, the front canopy was jettisoned. High speed windblast prevented intercockpit and radio communications, so the crew followed their prebriefed procedures by climbing and decelerating to allow cockpit communication. Once they determined that neither was injured and they had positive control of the aircraft, an assessment of damage was made. The front cockpit instrument panel was torn from its mounts on the left side and rotated 20 degrees toward Captain Gillette. Numerous instruments were broken and others dislodged. A join-up was made with nr 2, and Captain Gillette decided to land at Avon Park Auxiliary Airfield. Then the UHF radio control head in the rear cockpit began smoldering due to shorted electrical connections, forcing the crew to turn off the radio. By visual signals, they related to the wingman their intentions for recovery, by arresting gear, on the 5,400 foot runway. An aircraft controllability check was made in the landing configuration and flight control response was found to be satisfactory. Captain Gillette relinquished the lead of the flight to his wingman and flew formation on the nr 2 aircraft until touchdown. He was able to check runway alignment during the approach by looking through the hole in the left windscreen. The arresting gear was successfully engaged and the crew egressed the aircraft without further incident. Captain Gillette and Lieutenant Delk averted possible injury to themselves and the loss of a valuable aircraft by their prompt, professional actions. WELL DONE! ■

Above all else,
remember

To put that bomb on the target
Lay that pallet on the spot
Complete that low-level in weather
You must---

Fly the airplane
All the time

AEROSPACE

AFETY • MAGAZINE FOR AIRCREWS OCTOBER 1979

IN THIS ISSUE

Low Level Wind Shear

Slow Down Your Crosscheck

The BASH Program

low-level WIND SHEAR

CAPTAIN DAVID E. JOHNSON
3350 TCHTG/TTMV
Chanute AFB, IL

■ You say you're tired of reading about weather related hazards every time you pick up a safety magazine? You say you've read, experienced, and been briefed about so many weather hazards that you are now waiting for your associate degree in meteorology to arrive in the mail? Well, don't hold your breath. Instead, take the following TRUE/FALSE quiz on low-level wind shear to see how much you do know about this subject. The answers are at the end of this article, but don't peek until you're finished.

This article was adapted from the AWS Low-Level Wind Shear Forecaster Seminar (1977) and from DOT, FAA Advisory Circular No. 00-50A, 1/23/79, Low-Level Wind Shear.

LOW-LEVEL WIND SHEAR QUIZ

1. Low-level wind shear is a problem for small aircraft, but not for large jets.
2. Low-level wind shear is easy to compensate for if you are aware of its existence.
3. You should suspect low-level wind shear around a frontal zone, even if there is no weather associated with the front.
4. Low-level wind shear can be associated with rain showers as well as with thunderstorms.
5. The most hazardous low-level wind shear is always preceded by turbulence.
6. Low-level wind shear is normally more hazardous around warm fronts than it is around cold fronts.
7. Wind cannot affect an aircraft once it is flying except for drift and ground speed.

Now check your answers on page 3 and score yourself. Did you do well? If not, this article should prove to be quite informative.

Low-level wind shear can be described as a change in wind direction and/or speed within a very short distance between the surface and 2 feet AGL. Although wind shear occur at any level in the atmosph we will concern ourselves only the lower 2,000 feet, where the g est accident potential for tak landing exists.

Low-level wind shear has b identified as the primary or p able cause of several major craft accidents and is being reinv gated as the possible cause or tributing factor to other accid previously attributed to pilot erro

Low-level wind shear can h different effects on aircraft perfo ance, depending upon the situat An abrupt headwind increase car a very short time, create a rapid crease in indicated airspeed. reverse is also true. With an ab headwind loss, indicated airsp will drop sharply. Furthermo when the wind changes faster the mass of the aircraft can be propriately accelerated or dece ated, aircraft performance is affec Let's briefly examine each case.

Aircraft Moving from Tailwinc Headwind or Calm. If an aircraf

Continued on pa

TED STATES AIR FORCE

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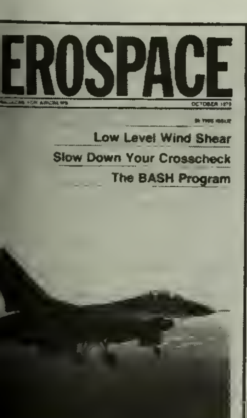

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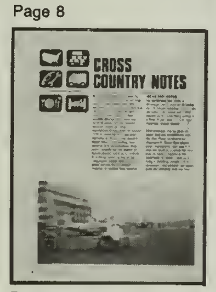

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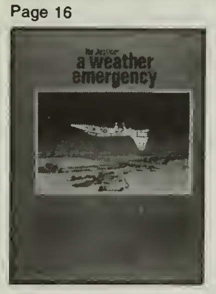

Page 26

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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Figure 1

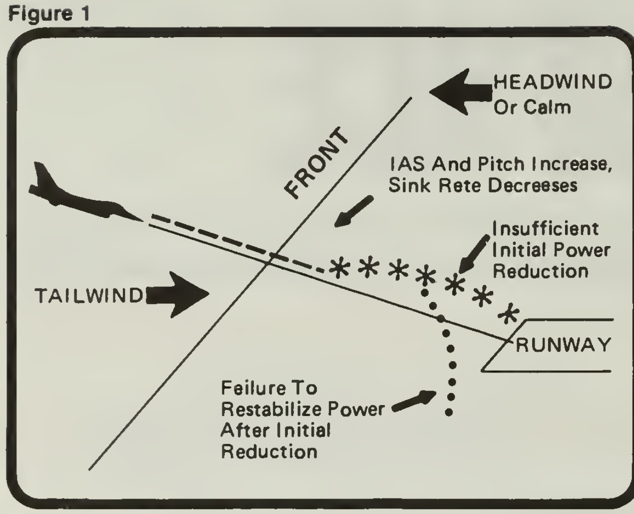
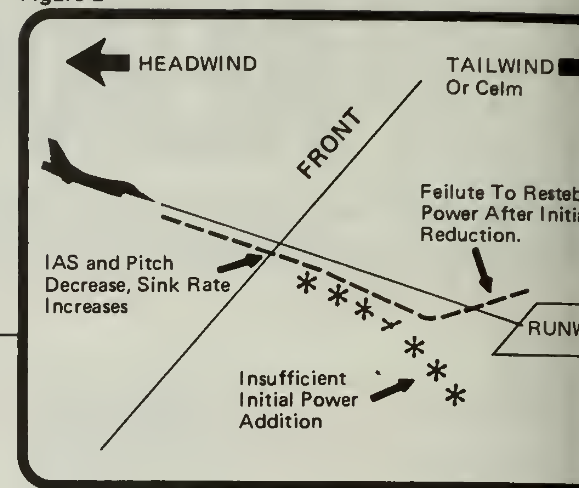


Figure 2



low-level WIND SHEAR continued

on approach in a tailwind condition that shears into a calm wind or a headwind, there is an immediate increase in indicated airspeed and the aircraft rises above the glide slope. Power should initially be reduced to correct this condition or the landing could be a long, fast one. After the initial power reduction is made and the aircraft is back on the glide slope, an appropriate power increase will be necessary to restabilize in the headwind. If this power increase is not accomplished promptly, a high sink rate can develop and the landing will be a short, hard one. This condition occurs primarily in downdraft and frontal passage shears (Figure 1). Other shears may require consistent correction throughout the shear.

Aircraft Moving from Headwind to Tailwind or Calm. If an aircraft is on approach with a headwind and shears into a tailwind or a calm wind, there is a sharp decrease in indicated airspeed and the aircraft drops below the glide slope. Here the aircraft will be both slow and low, and in a power deficient state. The pilot may pull the nose up to a point even higher than before the shear in order to capture the glide slope. This will aggravate the airspeed situation even further until the pilot advances the throttles and sufficient time elapses at the higher power setting for the engines to replenish the power deficiency.

If the aircraft reaches the ground before the power deficiency is corrected, the landing will be short, slow, and hard. If there is sufficient time to regain the proper airspeed and glide slope before reaching the ground, then a "double reverse" problem arises because the throttles are set too high for a stabilized approach in a no-wind condition. As soon as the power deficiency is replenished, the throttles should be pulled back even farther than they were before the shear. If the pilot does not quickly retard the throttles, the aircraft will soon have an excess of power and experience a hard, fast landing (Figure 2).

Aircraft instruments will indicate symptoms of a possible wind shear problem; however, relating these signals to changes in the environment may not be obvious to the crew. For example, although wind shear can be associated with turbulence, hazardous wind shear often occurs without turbulence. Low-level wind shear is not limited to stormy weather alone, it can occur even under "clear and 7" conditions. What follows is a quick look at some of the conditions where low-level wind shear can be expected.

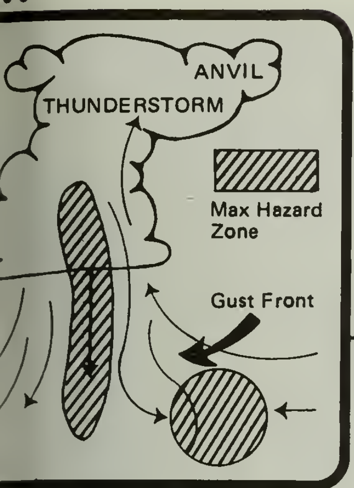
Cold Fronts Low-level wind s will occur with a cold front just the front passes the airport. If cold front is fast moving, the tential for low-level wind shear exist several hours after frontal sage.

Warm Fronts Data compiled wind shear indicates that the am of shear in warm fronts is far gr than that found in cold fronts. warm fronts, the shear occurs fore the front passes the airfield to 6 hours or more prior to fr passage). The potential for l level wind shear ends after the has passed the airfield.

Thunderstorms One of the dangerous low-level wind shear ditions occurs with thundersto Winds in and around thundersto are very complex (Figure 3). W shear can occur on all sides thunderstorm and in the downd directly beneath the cell. The shift line (or gust front) associ with a thunderstorm can prec the storm by 15 miles or more. result, low-level wind shear sh be expected whenever thundersto are present.

Rain Showers Although rain sh ers do not produce lightning, or tornadoes, they do produce w The basic wind structure in a shower is pretty much the s

re 3



at in a thunderstorm, except the s are generally not as strong. not uncommon for rain showers oduce winds on the order of 20 knots. Therefore, the ordinary shower should be considered a evel wind shear hazard if it is or adjacent to an airfield.

untain Waves These weather omena often create low-level shear at airports downwind of vave. A strong mountain wave xtend 300 miles downwind of untain range. The presence of clouds (roll clouds) and/or ular clouds (lens shaped clouds) ood indicators of wind shear. bsence of these clouds, how- does not necessarily indicate ear or turbulence, just the fact here may not be enough mois- vailable to form a cloud.

sty Surface Winds The com- on of strong winds and small or large buildings that lie up- of the departure or approach can produce localized areas ear. Gusty winds are asso- not only with the previously ioned phenomena, but also several others, including the ook and Foehn winds in the rn US and Europe, respectively, eezes, and inversions.

d/Sea Breezes Large bodies of can create local winds due to the differences in temperature between the land and water. Airfields located adjacent to large lakes, bays, and oceans can experience low-level wind shear due to these localized winds.

Now you should have a better idea of what low-level wind shear is and where it is found. Low-level wind shear affects all sizes of aircraft; regardless of what you fly, heed the warning if wind shear is in the forecast. The intensity of low-level wind shear is not readily determinable, as no standards have yet been derived. As this point, a low-level wind shear forecast consists only of a yes/no type forecast. As a result, even if you know that wind shear will be present, there is no standard way to compensate for it.

How does a pilot obtain information about the possibilities of low-level wind shear? There are several ways:

- *Forecasts* The best way to anticipate low-level wind shear at your destination is from the forecast. Don't hesitate to ask the forecaster about the possibilities of low-level wind shear.
- *PIREPS* Pilot reports are a major source of weather information; they provide real-time data to the weather forecaster. Your PIREP not only alerts the forecaster to a good or bad forecast, but also alerts another pilot to the possibility of low-level wind shear.
- *PMSV, FAA, and Tower Personnel* These contacts can keep you updated on both the latest weather information and the latest pilot reports. Do not hesitate to make these contacts and update your weather information.

Your awareness of low-level wind shear is now better, but by no means complete. Low-level wind shear is complex, and this article only serves as an introduction to the subject. Keep up-to-date as new info on low-level wind shear comes out and you'll be better prepared to cope with yet another weather hazard to your flight.

ANSWERS TO LOW-LEVEL WIND SHEAR QUIZ

1. False.
2. False.
3. True.
4. True.
5. False.
6. True.
7. False.

SCORING

NO. CORRECT	AWARENESS LEVEL
0-1	You have either been out to lunch or have been at a desk too long. This article is mandatory reading.
2-3	You are barely aware that low-level wind shear exists. Keep reading.
4-6	Good, but the ones you missed could be fatal. Read on.
7	Excellent. You've kept up on the subject. ■

ABOUT THE AUTHOR

Captain Johnson graduated from Ohio University in 1973 with a BS from the College of Arts and Sciences and an Air Force commission through ROTC. He attended the University of Texas at Austin for one year for formal weather training and was assigned to Moody AFB, GA, 1974-1978 as a weather officer. He is currently an instructor at Chanute AFB, IL.

Optimizing the Low Altitude Dive Recovery Maneuver

By **CLARENCE MONGOLD**/Section Chief, Technology
Reprinted courtesy of ***Product Support Digest,*** McDonnell Aircraft Co.

■ The outstanding performance of the F-15 permits maneuvering in the vertical plane for tactical advantage. Air Combat Maneuvers have been developed to exploit this performance advantage, and much time is devoted to training pilots in the performance of these maneuvers. The combat may be engaged at low altitudes or may descend from higher altitudes during the maneuvering. It should therefore be expected that at one time or another the pilot will find himself in a steep dive with the ground rapidly approaching. He must judge quickly the altitude needed for recovery and, in some situations, immediately initiate the optimum pre-planned recovery maneuver. TO 1F-15A-1 contains three dive recovery charts to inform the pilot of altitude requirements, and little need be added to this information. Therefore, in this brief presentation, I'd like to discuss dive recovery *techniques*.

AIRSPEED-LOAD FACTOR TRADEOFF

Pull-out radius, which determines altitude lost, is dependent simply on airspeed and load factor. High load factor combined with low airspeed provides a tight turn radius. This generic relationship, applicable to all air vehicles, is shown by Figure 1, which also shows the F-15 operating line for full aft stick pull-outs.

The data represents low altitude operation with 10,000 pounds of fuel, a centerline tank, and one AIM-9L missile — a loading often used for ACM training missions. Variations in loading will affect the pull-out radius but have only secondary effect on the optimum airspeed. For the F-15, the minimum pull-out radius and therefore the least altitude loss occurs at 300 KCAS.

This appears simple and straightforward, but before you decide to make all pull-outs at 300 KCAS, there are some other factors to consider. Figure 1 assumes a constant airspeed during the maneuver, which is difficult to achieve. Also, your airspeed at the start of the pull-out may be higher or lower than 300 KCAS. So, some relevant questions are —

- Should you delay the pul
until you have adjusted your spee
- Should you change engine th
- What about the speedbrake?

Figure 2 has been preparec answer these questions, using same conditions as Figure 1. Note here we are presenting the airs prior to the pull-out and the alti loss during the pull-out.

DON'T WAIT

The first thing to note from Figu is that a delay in initiating the pul in order to allow airspeed to buil is very unwise — too much altitu lost during the wait.

Compare the upper set of t curves with the lower set. For upper set, the 70 degree dive continued to allow the airspeed increase by 50 KCAS over the in speed. For the lower set, the pul began immediately, resulting in si icant altitude saving. Altitude los both cases is measured from the in airspeed condition.

". . . at one time or another, the pilot find himself in a steep dive with ground rapidly approaching. . . ."

/ AIRSPEED DIVE RECOVERY

he second observation from Figure that doing a hard pull from a low eed without sufficient thrust can you in trouble — note the steep rn at low initial airspeed of the curves using idle or military er. The cause of this is reduction oad factor capability due to ssive speed bleed-off. When the factor drops below 1.0, the reduc- in flight path angle ceases and very is precluded.

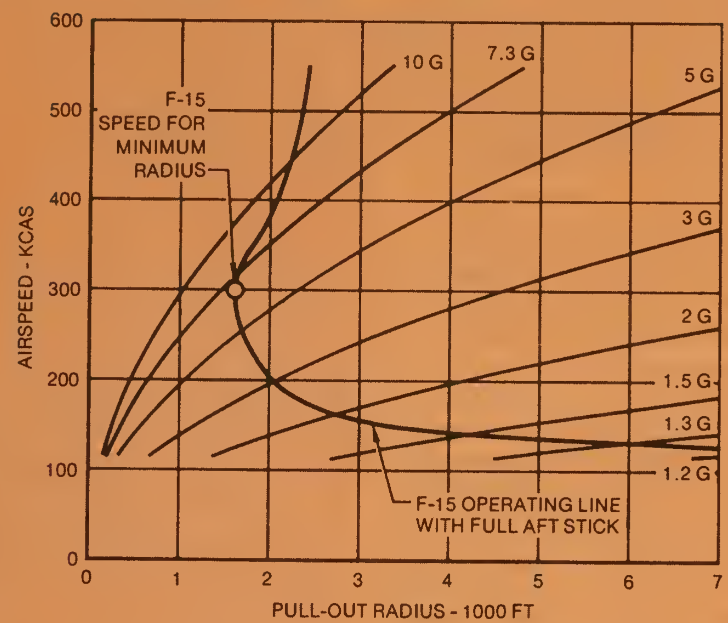
is is not the result of abrupt aero- mic changes since the F-15 high e of attack characteristics are oth and continuous. Nevertheless a situation which should be ded by using maximum power. maximum power used in the up initiated at 50 KCAS, the eed increased to 150 KCAS even gh the stick was held full aft. The factor built up to about 2 G e dropping back to 1.4 G at pletion of the recovery, at which the airspeed was 130 KCAS. The thrust level provided this in- ed airspeed but it is essential that mum afterburner be selected at ime the stick is moved full aft. entally, these conditions are in envelope of highest afterburner reliability.

course, airspeeds and load fac- re greater during the higher initial eed recoveries. A load factor of 2 generally not considered signifi- but at low airspeeds you have thing else going for you — the speed itself, and a small load r here will work wonders. This t is shown on Figure 3, which pares a low airspeed - low G ery with one made at high load r and a higher speed. The high factor in this situation is comfort- nitially but is no guarantee of ery.

I AIRSPEED DIVE RECOVERY

h airspeed dive recovery pre- a different situation, a problem h velocity. A look back at Figure ws that although the aircraft load r capability increases rapidly at airspeeds, the turn radius also ases at speeds above 300 KCAS. ever, the higher load factors still ice the tightest turns. TO 1F-15A-1 nmends load factors up to 10 G

FIGURE 1 — AIRSPEED-LOAD FACTOR TRADEOFF IN LOW ALTITUDE DIVE RECOVERY



(at a gross weight of 36,000 pounds) for emergency dive recovery. Obviously a rapid deceleration toward the minimum radius airspeed would be desirable, but again the laws of physics work in a contrary manner.

The structural load factor limitations restrict the angle of attack and the induced drag coefficient, limiting the aircraft drag increase in the

▸

pull-up. Because of this and the low profile drag of the F-15, more airspeed than desired is retained in a high airspeed dive recovery. The airspeed can best be reduced by immediately chopping the throttle to idle and pulling high load factor. Figure 2 shows the altitude loss resulting from such maneuvers and the adverse effects of military or maximum power. Figure 3 illustrates the greater altitude lost in high airspeed recoveries although a much greater load factor is available at high airspeeds. The pilot is cautioned to consider this carefully.

SPEEDBRAKE OPERATION

The speedbrake has very little influence on dive pull-out since its drag is small compared to the high angle-of-attack induced drag of the aircraft. Also, it will automatically begin to retract when the AOA exceeds about 25 cockpit units. However, if the switch is left in the aft detent the speedbrake will again extend when the AOA is reduced at completion of recovery. Therefore, retracted speedbrake should be selected for low airspeed recoveries. For high airspeed recoveries, good piloting technique dictates that advantage be taken of the small favorable effect of the extended speedbrake.

EASILY REMEMBERED RULES

The best recovery technique for other dive angles was found to be the same as that for the 70 degree dive, although with proportionally varying altitude loss. Based on this analysis, we have developed some "easily remembered rules" for low altitude dive recovery. The techniques vary between low speed and high speed primarily in the thrust used. The decision speed is biased to the high side to insure that pilots select maximum power for the critical low airspeed recoveries.

RULE NO. 1 — DON'T WAIT

- At airspeeds below 350 KCAS, select full afterburner immediately, while at the same time applying full aft stick (or the recommended maximum load factor).

At airspeeds above 350 KCAS, select idle power immediately, while at the same time applying the recommended maximum load factor

RULE NO 2 — DON'T FORGET RULE NO 1 ■

FIGURE 2 — ALTITUDE LOSS DURING PULL-OUT
Initial Dive Angle — 70°

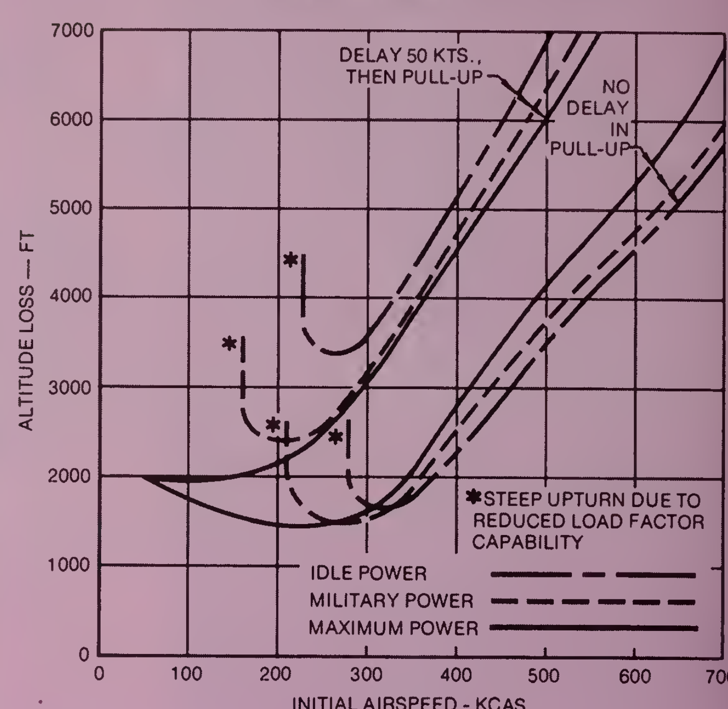
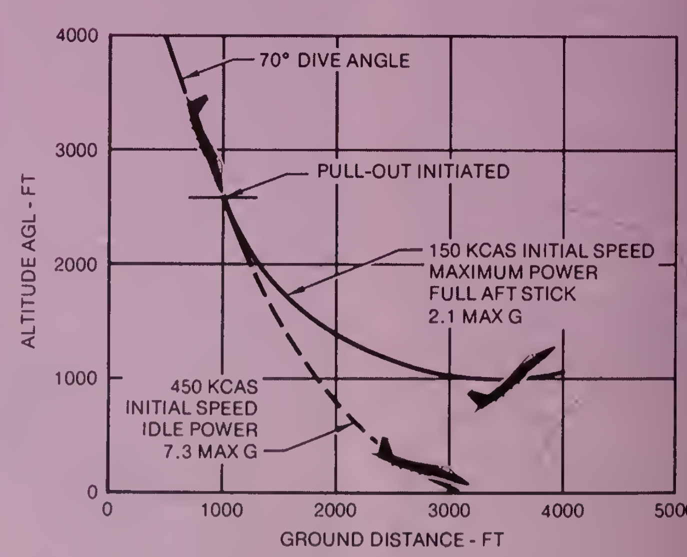
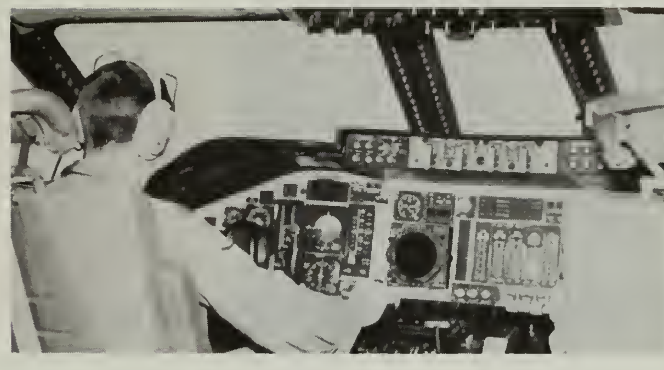


FIGURE 3 — F-15 DIVE RECOVERY



Slow down your crosscheck



PTAIN RICHARD P. MARTIN
ATC/DOTO, Randolph AFB, TX

You are flying an instrument pro-iency sortie. You have allowed ur airspeed to decay below final proach airspeed on a PAR ap-ach, so you add power to increase ur airspeed. The resultant change trim causes you to deviate from depath.

During the debrief, the flight tructor (IP) offers this sage advice a solution to your problem. *"You d to speed up your crosscheck."* u mumble to yourself, *"Wonder- advice . . . and such a fresh ap-ach to instruction."*

No matter how logical it may have nded to the instructor, this advice ways leaves us a little cold. Today are coping with the compressed e frame of high speed aircraft. ere is simply not enough time ilable to devote all of our attention the instruments. Much of the time the cockpit is devoted to crew co-dination, or talking to the command st or cleaning the spilled coffee off the auto-pilot console. Time shar- of cockpit duties and responsi-ities must be extremely well-nned and executed to allow all ks to be accomplished safely. If become engrossed in the cross-eck, we are risking a gear up land-, or some similar "day spoiler." More meaningful advice might be, ou need to learn how to SLOW WN YOUR CROSSCHECK." w of us have heard much discus-n of the way a crosscheck should rk since Undergraduate Pilot aining when we were told how to k at what and when to look at it. s assumed that anyone with wings ows exactly what to do but just doesn't do it fast enough.

If you really think about it, the efficiently executed crosscheck should be at a rate where an interruption, such as an aircraft emergency, does not detract from positive aircraft control. If the pilot relies on a speedy crosscheck and is suddenly peering through an obscuration trying to figure out where the runway is, he may lose control of the aircraft.

With a little thought and common sense, any pilot can analyze his or her own crosscheck to make it more efficient. Consider how you might plan your crosscheck during a non-precision approach and then read on as a comparison.

Upon arrival at the final approach fix (FAF), the main concern should be to establish a pitch on the attitude indicator which will result in the required rate of descent (already computed) while making a power reduction to maintain the required airspeed. At a given true airspeed, a given pitch change will result in a given rate of descent (see AFM 51-37, Chapter 2).

If timing is not the primary method for determining the Missed Approach Point (MAP), there shouldn't be too much concern with a little excess airspeed. The excess airspeed acquired can be bled off upon arrival at Minimum Descent Altitude (MDA). In fact, a little excess airspeed will do two things: (1) Provide extra energy for breaking rate of descent upon arriving at MDA, and (2) Delay the requirement to add power while leveling at MDA, thus cutting down pilot workload while at a critical phase of the approach.

After establishing pitch and power upon descent from the FAF, the emphasis should be on azimuth, while waiting for the vertical velocity to stabilize (NOTE: There has been no mention of the altimeter). Although the altimeter should be included in the crosscheck, it should be a while before the altimeter requires much attention, unless there is a step down fix altitude associated with the final approach course. Approaching MDA, the well established approach will require only slight changes. Upon arrival at MDA, establish level flight at final approach airspeed and trim to provide a capability to look outside for the runway without sacrificing aircraft control.

The point is this: An efficient crosscheck is a slow, deliberate process. Any inputs to the control instruments without a thorough understanding of the results is, at best, highly inefficient and may result in much more effort expended than necessary (a speedy crosscheck). Any further inputs to the control instruments without waiting for the performance instruments to stabilize may cause you to be working against yourself, even creating disorientation! If a speedy crosscheck is necessary, use it. But it should not be an instructional goal nor the goal of pilots for their own proficiency. ■

ABOUT THE AUTHOR
Captain Martin was an IPIS instructor prior to IFC closure and has contributed several "IFC Approach" articles. He now prepares changes to AFM 51-37 and AFR 60-16 for the respective OPRs of those directives.

CROSS COUNTRY NOTES

■ Travelin' again? We want to pass on some things we ran into on the road this last trip. We stopped at a few bases which are not on the Rex Riley list and probably never will be! That sounds strange, but there are several bases whose mission, location, traffic or other restrictions forces them to remain PPR or severely limit transient services or hours. This doesn't mean they are providing bad service, but nevertheless, they aren't eligible for the award. In future issues, we'll try to include a write-up about a few of the "ineligible" bases that provide good service to the limited number of visitors they receive.

IDEAS AND NOTES

OIL SHORTAGE Not really a shortage, but a number of bas are no longer keeping "10-10" on hand. This could put T-bird drivers (and some Navy jocks) a bind. If you use 10-10 in you machine, check ahead!

CERTIFICATES Just to pass on again that we recommend that the Rex Riley certificate be displayed in Base Ops where your "customers" can see it. If you can work it, it would be nic also to have a replica of the certificate or patch made up to hang in billeting, inflight, TA or wherever! This reminds the use (and the workers) that the Rex

y Transient Services Award is a team effort by many rent agencies on each base.

NKS We'd like to pass on e Rex Riley kudos to HQ C/DOOF for super scheduling stance as we sneak around country. Our appreciation also s to the folks of the 1400 S at Norton AFB for their port in numerous Rex Riley nsient Service Award uations. The help provided by e two organizations has been luable in the "revitalization" e Rex Riley program.

CHES A reminder that if a unit he list wishes to have Rex y patches, it is strictly local on and local purchase. We provide a sheet with cifications, sizes and colors, hat's about it. Same info ies to anyone who has a stion about "subdued" hes. All we can say is that re on your own.

AINED AWARDS

ION AFB Way out there in ern New Mexico, this is a place to stop for gas and real (not machined) on one of e X-C's. The TA folks hard at good service and fast ; good base ops, billets and s. Watch the gusty winds and altitude problems.

T AFB Continues to provide service to transients.

Runway gets a little short on those hot (or wet) days. Use caution and plan ahead.

K.I. SAWYER AFB We checked 'em out in the summer (of course) and found excellent services for transients. Another place to call ahead if you have a flight of many or a large machine.

WRIGHT-PATTERSON AFB Call ahead for billet reservations 'cause some of the motels are a long ride. They've had some construction going, so keep your eyes open. Also — lots of other airdromes and other craft in the area. Good food, service, facilities and folks. What more could you ask for.

NEW ADDITION

EGLIN AFB Glad to have these folks on the list. They have really worked hard and have their act together. We found a total attitude of helpful service toward aircrews in Ops, TA, inflight, etc., etc. The new "reception center" (billeting office) is super, and folks there aim to please. CAUTION — watch the restricted areas, traffic and changing weather. Eglin's a great place to stop.

We'll be back on the road again next month and hope to hit some of the places we haven't visited in the past 18 months. We're seeing good work and attitudes toward transient aircrews. Write . . . Rex Riley, AFISC/SEDAK, Norton AFB, CA 92409. ■

THE

REX RILEY
Transient Services Award

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AK
PETERSON AFB	Colorado Springs, CO
RAMSTEIN AB	Germany
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
TORREJON AB	Spain
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
NORTON AFB	San Bernardino, CA
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
CARSWELL AFB	Ft. Worth, TX
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayetteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND
VANDENBERG AFB	Lompoc, CA
ANDREWS AFB	Camp Springs, MD
PLATTSBURGH AFB	Plattsburgh, NY
MACDILL AFB	Tampa, FL
COLUMBUS AFB	Columbus, MS
PATRICK AFB	Cocoa Beach, FL
ALTUS AFB	Altus, OK
WURTSMITH AFB	Oscoda, MI
WILLIAMS AFB	Chandler, AZ
WESTOVER AFB	Chicopee Falls, MA
McGUIRE AFB	Wrightstown, NJ
EGLIN AFB	Valpariso FL

TO CLOS FO COMFOR

■ What do you think of an aircrew who can't solve the simplest navigation problems, gets lost twice looking for the bomb delivery run-in line, makes three simulated nuclear delivery passes and only gets one bomb off, gets their first fuel check 700 pounds below bingo, and can't figure out on which runway they are supposed to land? A couple of real turkeys, right? First range ride in RTU? A couple of senile field-graders, maybe? Wrong! This actually happened to a highly qualified, professional, and normally competent aircrew. Their experience is a real eye-opener.

The first indication that something was amiss appeared between ten and twenty minutes after takeoff. The crew had planned to make their time over target by turning short of Point A and going direct to Point B, but found they were incapable of figuring out the appropriate turning point. This inability to make a routine computation was rationa away by both crew members as being necessary to the mission.

They were able to stay on co around the route, but couldn't f out how to adjust for time. Aga the inability to properly reason not accepted by the crew memb who laughed off the implication they were not functioning norm

The AC first began to suspec something was amiss as they approached the initial point (IP) he counted to five forward and backward to check his mental functioning. Since he could easi accomplish this rote task, his suspicions were allayed. They t turned at the IP and promptly g lost looking for the run-in line. WSO had the reflector on the ra but didn't believe it to be a prop return, and wandered too far off

e to make a successful bomb They came around again and more could not find the run-in The third run was successful he bomb was nearly unscorable.

ey managed to complete the bomb events, and as they d up for strafe, the AC finally mbered to get a fuel check, the of the mission. The WSO mbered mild surprise at finding hey were already 600 to 700 ds below bingo. The AC made bled transmission about a cted fuel problem and turned rd home without waiting for the of the flight to join up. The then realized that something radically wrong, but by this their judgment was severely ired.

eir wingman also became aware ead was having an apparent ological problem, declared an gency, and convinced the gy aircrew to divert to a closer ary field. Lead then called for eceived the current weather, either crewman could rehend the report. On the way men selected 100 percent en "several times," but as they ot notice any immediate ovement they didn't stay on 100 nt very long.

th crew members' recollections ents from this point on are mely hazy. They were confused approach control's instructions, ould not ascertain if they were vectored for a precision ach or a VFR pattern, nor did know the active runway. The remembers the AC asking him to make sure he lowered the gear, but the WSO forgot to do so. Also, during this time, the affected crew cancelled the emergency that their wingman had declared!

Somehow the gear was lowered and the aircraft safely landed. The WSO distinctly remembers reading the checklist, but a postflight inspection of the cockpits revealed some glaring omissions; the 20mm nose gun was still armed and hot, the inertial navigation system was still on, and many other switch settings were not in compliance with the aircrew checklist. Fresh air revived both crewmen, but both complained of severe headaches and nausea which continued for some time. Unfortunately, the flight surgeon was not present immediately after landing since the crew had cancelled the emergency, and the delayed blood samples and tests could not reveal the cause of the suspected poisoning. Exhaustive testing of the aircraft oxygen, air conditioning, and electrical systems failed to reveal the source or presence of any toxic fumes.

Although a definite cause factor was never determined, several things of importance can be learned from this experience. The crew's symptoms were very similar to those of hypoxia, but did not respond rapidly to 100 percent oxygen as hypoxia does. The flight surgeon stated that the crew's symptoms probably would have been relieved if they had gone to 100 percent oxygen and stayed there. Thus, if you experience similar symptoms, stay on 100 percent unless the symptoms get rapidly worse.

Secondly, the first symptom is an impairment of mental functioning; if you can't solve a problem you ordinarily are able to, take that as a danger sign. And simple rote exercises such as counting to five forward and backward can be very misleading. By the time you are incapable of counting to five, it will be too late!

Thirdly, the aircrew were reluctant to admit that anything was wrong, even when the problem was quite evident. This could easily end in disaster; if it is obvious your mental functions are not normal, swallow your pride and take whatever steps are necessary to correct the problem.

That may include relinquishing control of the flight and landing at the nearest suitable installation with a flight surgeon available. No one enjoys leading a flight more, perhaps, than a fighter jock on a bombing mission, but you must recognize deficient performance if it occurs and take prompt corrective action.

Finally, although the wingman's actions in declaring an emergency and convincing the crew to divert probably saved their lives, if that action had been taken sooner this story would have been considerably less hairy. One should not always assume that lead knows what he is doing, and significant deviations from the flight briefing should be questioned. And flight leads — don't discourage this kind of questioning; it could save *your* butt someday. — *Anonymous.* ■

COLD FACTS

MAJOR GARY L. STUDDARD
Directorate of Aerospace Safety

■ Circle the correct answer:

You are cruising at FL 370 and the flight is proceeding normally. You notice an altimeter reading of FL 375 and attempt to correct back to FL 370 by retarding power and pushing forward on the controls. To your bewilderment, no effect is noted on either your indicated altitude or VVI; additionally, you note a steady increase in your airspeed even though you continue to retard the throttles and you extend the speedbrakes. You lower the gear and you apply further back pressure on the controls but the airspeed continues to increase. So, what's the problem.

A. You've just entered a jet stream.
B. There is a system malfunction resulting in erroneous instrument readings.
C. The engines are working at peak proficiency generating excessive thrust.
D. The pitot static system is blocked with ice.

Based upon the limited information I've given you, either B or D would be the most probable explanation. If a descent is started and upon reaching a lower altitude, all instruments return to normal, then D becomes the most obvious answer.

In a recent Class A mishap, the aircrew was faced with the circumstances cited above. Unfortunately, the mishap never progressed to the point where a descent was accomplished to an altitude low enough to allow the ice to melt. In this mishap, the sequence of events led to the aircrew's preoccupation with the airspeed increase, to the point that the aircraft was slowed to a stall condition and the aircraft departed controlled flight. The crew successfully ejected, but one more aircraft bit the dust. The investigation revealed that during a prolonged aircraft down time, the base experienced heavy thunderstorms, and water most likely entered the pitot static system of the mishap aircraft. As the flight progressed at FL 370, the outside temperature caused the water to freeze, resulting in the vertical velocity indicator and the altimeter being captured at the existing readings and the airspeed indicator to increase.

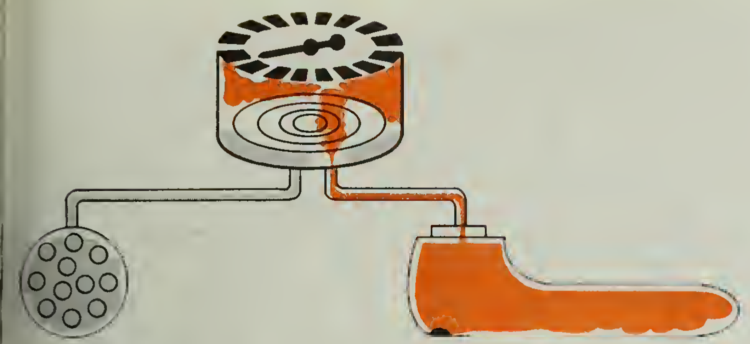
The computer at AFISC contains numerous reports of in-flight loss of pitot static indications as a result of icing. Most were recognized for what they were and the pilots safely recovered the aircraft. Periodically, however, history does repeat itself and an aircraft accident is caused by the insidious loss of aircraft instruments as a result of icing. Prevention of icing, which on the surface seems relatively simple, could have averted these mishaps.

Modern day aircraft are equi with sophisticated systems to vent icing; however, year after these types of reports keep co in as evidenced by the following

■ Shortly after level off at FL the F-106 pilot reported loss o pitot static system instrume Climb to altitude had been ac plished through areas of heavy Loss of the altimeter and ver velocity were followed sho thereafter by loss of airspeed. aircraft was scrambled to pro assistance. After rejoin, and du the descent, the aircraft's pitot s problems cleared and indicat returned to normal. Investiga revealed the pilot inadvertently the pitot heat switch off for the in portion of the flight.

■ During climbout in instrum conditions and while passing 210, the airspeed in the F-4D v to zero. Climb was continued VMC on top using inertial gro speed and angle-of-attack ind tors. Join-up with another F-4 made. During a wing approach, airspeed indications returned. Ca of the mishap was the pitot-t heater was inoperative and s sequent ice blockage of the p system occurred.

■ The student pilot in the T noted an airspeed reading of knots. He confirmed his actual speed at 300 knots with another craft. The altimeter showed altitude of FL 285 when actua at FL 200. The VVI was unrelia Later investigation revealed t while on the ground, followi heavy rainfall, water had collec



of the pitot static heater resulting sticking and erroneous instrument dings when the system was subted to below freezing temperaes at higher altitudes.

Without becoming too academic, s easy to see many variables can pact on icing problems. In the t example, the F-106 pilot failed utilize the pilot heat until late in mission. Not much can be aned here except Air Force and nmand regulations are explicit regard to operation of anti-icing tems when flight conditions wart their use. In example two, the ot had selected pitot heat but the tem malfunctioned. The keynt here is that when the capability sts, always verify the system if ctional during pre-takeoff checks. e last example points out the essity to ensure that all mois- e is purged from pitot static sysns prior to takeoff. In each case d above, the ability to properly rpret the situation led to success- recovery of the aircraft which ds me to my next point. Proby the instrument most often afted by icing is the airspeed inator.

ollowing a crash of a Boeing 7 in 1974, investigators deterned the cause was ice-clogged ot probes which resulted in the speed indicators behaving like meters. During the climb, aired steadily increased. The ots continued to increase pitch n attempt to arrest what appeared be a dangerously fast airspeed. altitude increased, so did the icator airspeed. The pilots conied to raise the nose until the aircraft stalled. Later, several professional pilots were subjected to simulator profiles duplicating the profile of the mishap aircraft, More than half of them fixated on the erroneous airspeed indicator. The study went on to conclude that in a pinch, pilots tend to revert and react to airspeed indications. To refresh you on the pitot static principles as they relate to airspeed, here is a quick review.

Airspeed measurement is merely a comparison of pitot pressure and static pressure. If the static system is operational, but the pitot system becomes blocked with ice, then the airspeed indications will increase as the aircraft climbs or decrease as the aircraft descends. This was the problem encountered by the 727 aircrew. Conversely, if only the static system is affected, then airspeed will indicate lower than it should as you climb and correspondingly, higher than it should during descents. And finally, for aircraft which have the static source located on the pitot tube, a blockage of the pitot tube affects both systems. Most often the airspeed will remain constant at the speed at which the system was blocked.

To say that your airspeed will either increase, decrease, or remain constant based upon the system which is blocked, is in the category of a real "astute observation." However, a good understanding of the symptoms will probably lead to quicker diagnosis of the problem.

No article is complete without a concluding list of reminders. So, here once more (and they will most likely be repeated in similar articles in years to come) are some *Points to Remember on Icing*.

1. Icing may occur during any season.
2. Don't rely on the weather guy to always be accurate in his forecast.
3. Have systems purged of any moisture prior to your leap-off.
4. Use pitot heat (if the capability exists, accomplish a ground check and ensure circuit breakers are rechecked).
5. Avoid areas of possible icing (clouds above mountains, freezing rain, and areas of clouds immediately above the freezing level).
6. The first indication of icing may be false flight indications.
7. If icing is encountered, depart the area as soon as possible. (Climb above clouds or to temperature below −20 degrees C, or descend to areas of warmer air).
8. If you suspect icing, establish a known pitch attitude and power setting. Cross-check the attitude indicator against the standby attitude indicator and cross-check the angle-of-attack.
9. Get assistance from other aircraft/controlling agencies concerning your aircraft parameters.
10. Know your aircraft anti-icing systems and their limitations.
11. Report all icing conditions so your fellow aviators can avoid the area.

While I'll be the first to admit that talking about icing is not one of the more interesting subjects, the facts remain that this phenomenon is a major weather hazard which manages to take its toll each year. The solutions to icing avoidance, or countering its effects, definitely require expertise, talent, and astute awareness. Here's hoping that the only ice you ever encounter is in your favorite drink. ■

4 BLUE NEWS

FATAL MISHAPS UP: A SPEC[IAL] REPOR[T]

■ Destroyed aircraft rates are up, higher than they have been since 1969.

Fatal mishap rates are up, higher then they have been since 1959.

Mishaps caused by logistics factors are down slightly and are reasonably stable.

Mishaps involving bombers, cargo, trainers, and helicopters have not increased.

Fighter and attack aircraft are the controlling factor, and it is the operations-type mishap which is the driver.

Control losses (pilot induced) and collisions with the ground or water where a good aircraft, as far as we know, is flown into the ground are the two categories of mishaps which are primarily responsible for the increase in our destroyed mishap rates.

■ From 1 January 1978 through 15 August 1979, 18 collisions with the ground involving fighter aircraft have occurred. Twenty-eight people have been fatally injured in these mishaps. If our 1974-1976 norm had been maintained for this type of mishap, only five would have [oc]curred.

■ Since 1 January 19[78] 26 pilot-induced con[trol] loss mishaps have [oc]curred, resulting in 33 [fa]talities. If our 1974-1[976] norm for this type of mis[hap] had been maintained, would have had 14.

The tactical forces wh[ich] comprise the majority [of] the fighter/attack force [are] primarily affected by [the] increase in fighter/att[ack] mishaps. It is clear the [...] has increased in our tact[ical] operations.

The fatality rate is [af]fected by the increase [in] collisions with grou[nd]

DESTROYED AIRCRAFT HISTORY/COMPARISON

	1978	1979	78-79 TOTAL	74-76 NORM	CHANGE
ALL OPS	51	39	90	65	+25
ALL LOG	36	14	50	51	− 1
ALL OTHER	3	5	8	8	0
TOTAL	90	58	148	124	+24

Since 1 Jan 78 through 14 Aug 79, there have been a total of 148 destroyed aircraft resulting from our mishaps. Had we maintained our 1974-1976 norm, there would have been 24 less. The Ops category increased 25, the Log category decreased 1, and undetermined and weather-type mishaps remained the same. The entire increase and then some has been generated by the Ops category accidents.

NON-FIGHTER DESTROYED AIRCRAFT HISTORY/COMPARISON

	1978	1979	78-79 TOTAL	74-76 NORM	CHANGE
NON-FTR OPS	15	4	19	20	−1
NON-FTR LOG	10	3	13	15	−2
NON-FTR OTHER	1	1	2	4	−2
NON-FTR TOTAL	26	8	34	39	−5

Since 1 Jan 78 through 15 Aug 79, there have been 34 non-fighter attack aircraft destroyed. We have experienced five less destroyed aircraft than we would have had we maintained our 74-76 norm.

time, in fact it's long overdue for us to look at ecord. It isn't too shiny. There are complex cause ionships, but the fighter and attack aircraft are controlling factor. And it is the operations-type ident that is the driver!

Why have the fighter/attack operational accidents reased in frequency? Several reasons: the first is that we're doing the hard things more often; the second is that we're operating more often at the low altitudes, and the third, of course, is that the intensity of our training has increased.

Despite these differences in training scenarios, destroyed aircraft and fatality increases must be contained. Here's some plain talk about *your* recent record:

mply because few crew embers survive such mishaps.

The control loss fatalities fer a completely different problem. All but three the fighter aircraft departed from controlled ight below their minimum covery altitude and above e capability of their ejecon equipment. The ejecon decision should have en automatic, yet in only ne of the mishaps were ere no fatalities. Six of e crews didn't even attempt an ejection.

■ The collision with e ground mishap is set up almost every instance by straction, inattention, or annelized attention, hich detracts from the lot's ability to maintain situation awareness. With reduced margins for error in the low altitude environment and our increased activities in this environment, the risk is high. The novice to the most experienced is susceptible to the collision with the ground mishap if he allows his attention to be focused away from flying the aircraft for whatever reason. Gaining altitude does not seem to be an option considered.

■ The control loss type mishap is primarily set up in the highly competitive environment of DACT/ACT/BFM. The subtle predeparture symptoms for the various types of aircraft are either ignored in the heat of battle, not noticed, or not known.

Major efforts to reduce these types of mishaps must revolve around coping with distraction and the reduction of departures, specifically in the low altitude environment.

■ Our efforts should be primarily focused on management of the risk which is inherent in our low level tactical operations and in ensuring that our pilots are aware of the current trends. Then encourage and support their decisions to save their lives when faced with impossible situations.

FATAL MISHAP RATE ALL AIRCRAFT 1959 - 15 AUG 1979

1959	2.2	1969	1.6
1960	1.5	1970	1.1
1961	1.8	1971	.8
1962	2.0	1972	1.2
1963	1.8	1973	.8
1964	1.6	1974	1.3
1965	1.7	1975	1.0
1966	1.5	1976	1.1
1967	1.4	1977	1.2
1968	1.4	1978	1.3
		1979	2.26

FIGHTER/ATTACK MISHAP RATE 1973 - 15 AUG 1979

1973	2.3	1976	2.2
1974	2.7	1977	2.7
1975	1.9	1978	2.8
		1979	4.9

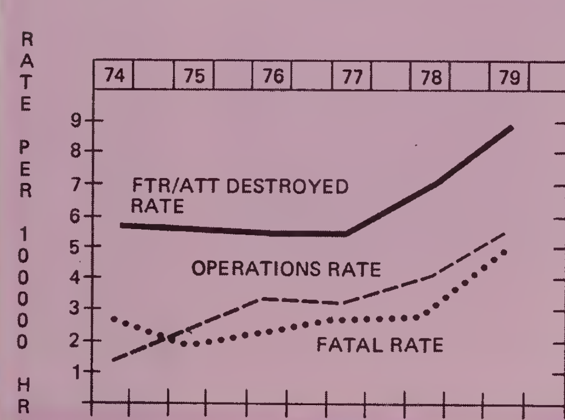
The 1979 fatal mishap rate as of 15 Aug, based on time estimates for Jul and Aug, is 2.26 fatal mishaps per 100,000 flying hours. This rate is higher than it has been since 1959. In 1959 there were 472 destroyed aircraft. In 184 of these mishaps (39 percent), a fatality occurred. In 1979 there have been 58 destroyed aircraft; in 34 of these mishaps (59 percent), fatalities occurred. It is clear that our mishaps are much more serious in terms of fatalities than they were in 1959. The fighter/attack fatal mishap rate is the prime reason our fatal rate is up. ■

FIGHTER/ATTACK DESTROYED AIRCRAFT HISTORY/COMPARISON

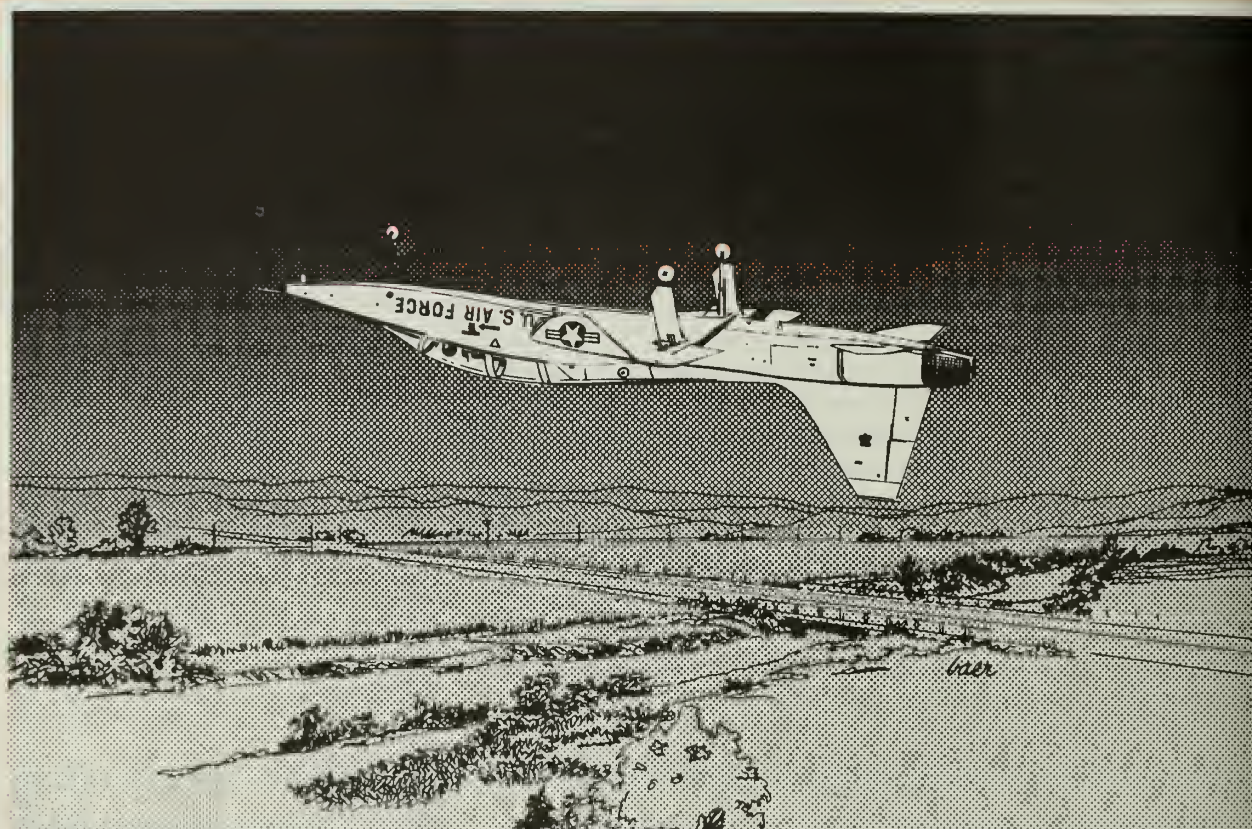
	1978	1979	78-79 TOTAL	74-76 NORM	CHANGE
FTR OPS	36	35	71	45	+26
FTR LOG	26	11	37	36	+ 1
FTR OTHER	2	4	6	4	+ 2
FTR TOTAL	64	50	114	85	+29

Since 1 Jan 78 through 15 Aug 79, there have been 114 fighter/attack aircraft destroyed. Had we maintained our 1974-1976 destroyed aircraft norm, 85 fighter/attack aircraft would have been destroyed. Twenty-six of the 29 increase in destroyed fighter/attack aircraft resulted from operations factors, 1 from logistics factors, and 2 were in the undetermined/weather category. One mishap, the F-15 from Europe, in the "other" category is still under investigation.

FIGHTER/ATTACK RATE COMPARISONS JAN 1974—JUL 1979



No Justice: a weather emergency



■ "Lancer 32's missed approach."

"Roger, standby this freq for departure."

"Lancer 32." Nose up 3°, airspeed through 160, gear up, flaps up, nose to 4° to catch the sink from the flaps retracting. Way ahead of it, looking good. Engine checks good, VVI positive, 1,300 feet to go to pattern altitude. Airspeed through 235, power back to 90 percent for a 250 knot climb. Off flag on the ADI. Master Caution flashing. Generator failure. No sweat; Boldface accomplished. Crosscheck the standby ADI. Will the generator reset? Nope.

He's doing all right so far. Boldface out of the way. Airplane in the soup but still under control. Now, what's his plan?

Where should I land? No check in the wallet, and $2 plus coins won't get a Q room. "Lancer 32 request immediate RTB to Homeplate. Declaring emergency for generator failure. One soul on board, 2+00 fuel remaining, negative ordnance, will require departure and cable."

"Roger, Lancer 32, turn right 060, climb and maintain niner tho sand."

"Right to 060, out of 12 point for nine thousand, Lancer 32." Ma be it'll reset now – nope. Holy . . off flags on everything! "Approac 32 requests emergency vector an immediate descent for full stop Boondock Field."

"Roger, Lancer 32, turn right t 180, descend and maintain 2400."

APTAIN DAVID M. BURNETT
55 TFW
avis-Monthan AFB, AZ

"Unable 180 vector, Approach, quest gyro out vector."

"Roger, Lancer 32 turn right ow." "Roger."

Change one. Still doing okay, ough. Wonder if he'll figure out at he knocked the inverter off the ne when he tried to reset the gener- or?

Okay, roll right. Looking good. irspeed climbing, throttle back. hat the hell happened to the in- rter? This rain must've shorted mething out. Altimeter unwinding rough 1800! Roll out and recover! ere's the ground. How'd I get in- rted?!? Okay, got it recovered now th a couple of hundred feet to spare.

Getting more sporty all the time! ow that he's locked on to terra firma should be able to hack it. Hope he ts on the turn needle if he goes pop- e again, though–it's all he has t!

Vis is lousy and there are low ouds up ahead. No way out. Crap, ck in the soup. Enough of this al- ady. Burner, back on the pole. Got climb out of these clouds. The tops ould be around eight thou. Come altimeter, keep winding up. Air- eed's bleeding off a bit. Decrease ck pressure. Altimeter's slowing down. Level at five thou! More back stick—got to keep climbing. Hell, now it's unwinding again! What gives? Airspeed climbing, altimeter still unwinding—through 1500—EJECT!

Good idea, but too late. If he'd been back in the GCA pattern at Homeplate he'd have known about the low hills he's going to hit just before man/seat separation.

"There ain't no justice and timing is everything."

—outgoing wing commander after a busted ORI.

Lancer 32 would have agreed with the anonymous colonel (different wing, different base, different problem. In case you're wondering—the quoted colonel's boys didn't qualify in strafe that week). A high-timer with good hands and above average emergency procedure knowledge, 32 was doing a fair to middling job of handling his emergency. Then he forgot rule number one—maintain aircraft control. Or maybe he didn't know exactly how.

It wasn't an easy situation—in the soup, needle, ball, and airspeed essentially. His standby ADI was good until he inadvertently knocked the inverter switch to off while trying to reset the adjacent generator switch. It just doesn't seem fair for the weather, unfamiliar terrain, generator failure and inadvertent inverter problem to gang up on anyone at the same time, but there he was, and when he needed it most, he didn't have it.

A quick scan of the computer memory banks at AFISC shows that others have faced similar situations, and some have even brought their crippled birds home safely. Could you? Those who have been able to hack it knew that once the main and standby ADI were gone, they had to get on the turn needle, airspeed and altimeter. That also may have been obvious to lots of you reading this article, but I know at least one fighter jock who hadn't worried about such niceties since UPT!

Once you've thought about it, you're probably in pretty good shape should Lancer 32's situation greet you one day. If you think you know but want to be sure, or are just interested in an enlightening review of partial panel flying, motor over to the Ops Desk and pull AFM 51-37 out of the FCIF.

After you think you've got it straight in your mind, you might like to put it to use. Try it during your next sim, or if your unit doesn't have a sim, give it a go on your next flight (VFR and frequent peeks at the ground and other instruments are authorized and highly recommended the first time you try it, and until you're sure it works for you!). Have you practiced partial panel approaches? How about needle, ball and airspeed—could you control it in a climb to get out of the clouds? How about a final approach? Check the Dash One—will the needle still work with DC power only? Give it some thought and get your plan together. You'll probably never need to use it, but you'll probably live through it and have a hell of a story to tell at the bar if you do. ■

243 MHZ BEACONS
Terrain and the downed flier

CAPTAIN M. STOPANI-THOMPSON
(Courtesy *Flight Comment*, CF)

■ After a crash or a forced landing, a downed flier resorts to his personal beacon to increase his chances of rescue. This is a very wise move for statistically having a beacon greatly increases his probability of rescue. From a technical standpoint, however, mere operation of a beacon without consideration of the theoretical side of its operation, throws different weights on the "wiseness" of that decision. The purpose of this article is to cast some light on optimizing the operation of a beacon such that the radius of detection is maximized within the constraints of personal injury, nature of terrain and mobility over terrain of the downed flier.

It must always be remembered that UHF transmitters operate on the line-of-sight principle and anything that gets in the way of the radiated energy will shadow the search aircraft antennae and reduce the chances of detection.

The purpose of the study was to determine the effect of Canadian terrain factors on UHF emergency locator transmitters (ELTs). Computer antenna patterns were compared to the real world for validity and from them came the calculated detection ranges for various types of Canadian terrain.

Typically, due to the low output power of personal beacons, search aircraft require large external antennae which restricts available devices to simple left-right homers. Beacon power output is fixed by the manufacturer and degraded by real-time battery condition. Signal-to-noise ratio of the homing device is also fixed *so the burden falls upon the downed flier to do what he can to increase the effective output power of his one and only beacon.*

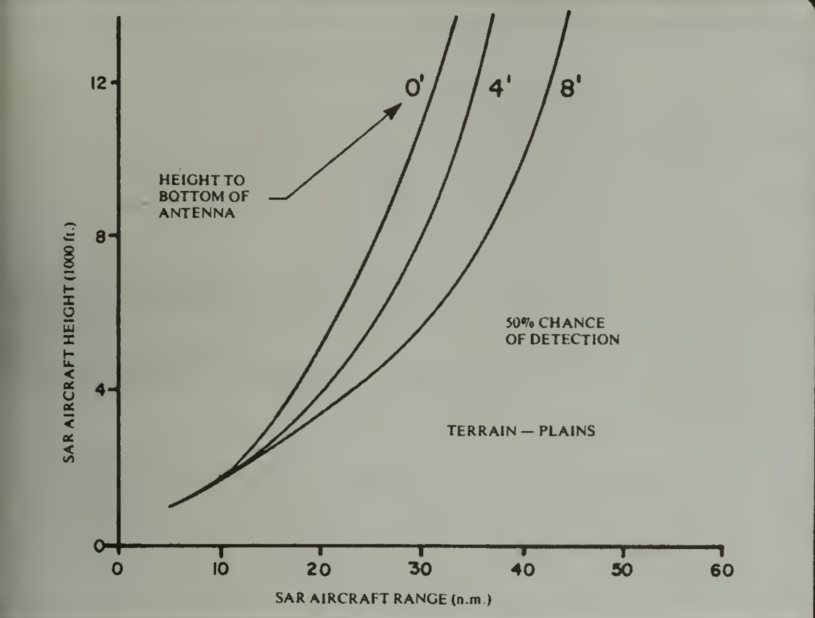
What factors affect the range of detection? The partial list of answers is as follows: vegetation, terrain, height above ground and weather. The last factor can be dismissed as everybody talks about it but nobody does anything to it, which leaves only three main factors worthy of consideration.

The first factor is the hard stuff that we walk on, called "ground." There is considerable amount of theory to show that the conductivity of it greatly affects the radiation pattern, the input impedance and the *power gain* of the antenna. The magic words here that the downed flier must remember are the "POWER GAIN," but how does one guess at the conductivity of the ground in order to get it? Computer calculations show that if you increase the height of the beacon above ground, the conductance of the ground plays less and less of a roll in decreasing the radiated power.

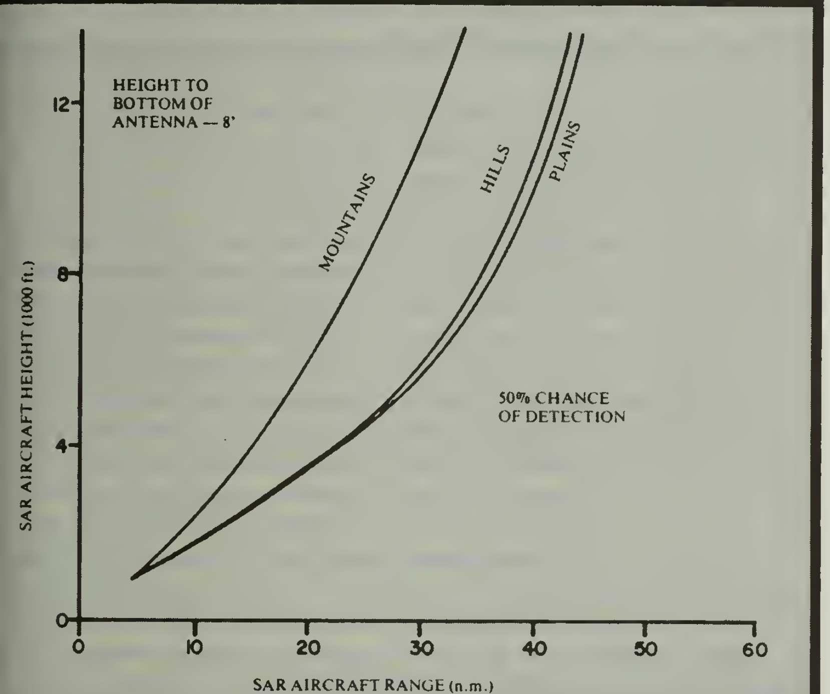
Consider Table 1, which tabulates the results of calculations for a rescue aircraft (flying a course tangent to the beacon circle of radiation and having a 50% chance of detection) for various heights of a beacon antenna above ground. Considering m of the factors listed above, if all permutations and combinations fed into a great number-cruncher a computer, the result is a pile graphs. To be meaningful, only th that apply to the "50% chance detection" were selected and played as figures and a table with article. This means that if a SAR craft approaches closer to the beac the chances of detection increase the SAR aircraft is farther away, probability reduces below 50%. T 50% becomes the AVERAGE u which to build up the rules lis below.

Note that all the rules are REL TIVE to each other. The curves based on an Acme Super-Du Under-the-Counter Low Pov Mathematical Model Beacon and received by the corresponding Ac Super-Perfect Aircraft Model Mat matical Receiver. Any difference "models" will cause the graphs expand or decrease RELATIVE each other. If the downed flier u the Acme Military Over-the-Coun High-Powered Model, he can exp the graphs to expand greatly but, the aircraft VHF antenna have be known to be found under five inch of rain water and hydraulic fluid, ranges shown in the figures tend bear a faint resemblance to the expected in the real world!

Rule No. 1. Raise the beacon to reasonable height above the su rounding terrain. For example, pla the beacon on a boulder in a flat ar plain and wedge rocks around it prevent it being blown off. Altern tively, farther south, tie it to a tr



RULE no. 1. Raise the beacon to a reasonable height above the surrounding terrain.



RULE no. 2. The more open sky the beacon sees, the longer will be the range of detection.

a pole. Remember that reception ge is increased typically by 20 to percent when the base of the an-na is raised eight feet above ground el.

he second factor is terrain. This tends to be decided in that instant in time when your engine sheds turbine blades like a tree sheds leaves in a fall storm. In that deadly hush when all airmen wish they were home having a beer instead of earning flight pay, the terrain becomes fixed into one of three basic categories:

a. Plains (very smooth to slightly rolling).

b. Hills (rolling plains and hills).

c. Mountains (mountains to extremely rugged mountains).

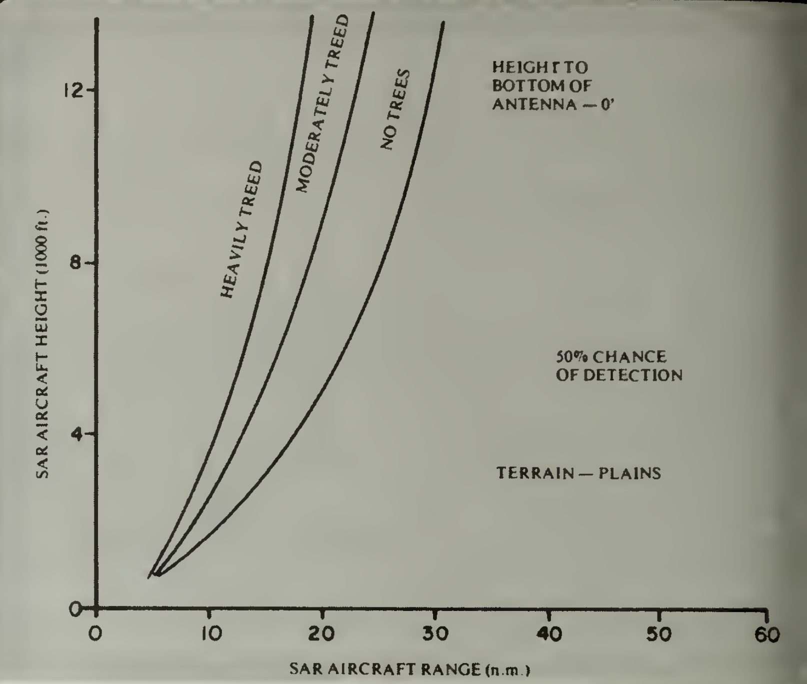
Once the downed flier finds himself to be at last safe with feet on the ground, he wants to be found and found fast. If it's raining and he decides to carry his beacon into a handy nearby cave to keep him company, then the only way he will be detected is if the search plane flies through the entrance! In exactly the same manner, if the downed flier finds himself to be at the bottom of a steep gully, he must expect that the radiation pattern will be severely restricted by the sides of the gulley. The search aircraft will have to almost be on top of him to detect the beacon.

TABLE 1 – 243 MHZ SAR A/C AT 8000′ AGL.

TERRAIN	ANTENNA HEIGHT	RANGE FOR 50% RECEPTION
Mountains	0	18 NM
	4	22
	8	24
Plains	0	26 NM
	4	30
	8	36

Rule No. 2. The more open sky the beacon sees, the longer will be the range of detection.

To abide by this rule, carry the beacon to higher terrain and then magnify the range by using Rule No. 1 to increase its height above "ground."



RULE no. 3. If you cannot see the sky for the trees, move where you can.

A variation to all terrain is the consideration of the vegetation that grows on it. Considering the tall variety called "trees" which for a computer study can be gathered into three groupings, namely, lightly, moderately and heavily treed terrain: it can be blandly stated that because they interfere with the line-of-sight of the beacon to the search aircraft, trees will reduce the maximum range of beacon detection by SAR aircraft. A downed flier must expect that when operating his beacon on the woodland floor even with a "good conductive ground," he will get 25% less range in moderately treed and 45% less range in heavily treed terrain over what he could expect to get in a lightly treed, similar terrain.

Rule No. 3. If you cannot see the sky for the trees, move to where you can.

This is seldom possible unless an open lake shore is handy—so common sense says to revert to Rule No. 1 and raise the beacon as high as possible into the trees. For example, use parachute cord to get a weighted line over a high branch *before* lashing the beacon to the line and haul it gently up in the air. Leave the weight on the line to aid in lowering it back down.

There is one last rule to be considered but it has nothing to do with terrain. It concerns beacons that have a radio transmitter and receiver in them. All quarter wave length antenna generate radiation patterns that roughly resemble a doughnut. Because a SAR aircraft will be using a left-right homer against low power beacons, the typical homing run will be done at constant altitude. The detection of the "cone-of-silence" or the hole in the doughnut pattern, tells the SAR aircraft pilot that he is very close to the beacon. The pilot pinpoints on his map the spot on the ground where he lost the signal on entering the cone-of-silence and flies the same course until he picks up the signal again on the other side of the doughnut hole. Visually noting his second position again on the ground, the pilot splits the distance and spirals in on the location of the beacon.

If, however, the downed flier snatches up his beacon and changes to voice, he has to tilt the antenna to get radiation energy to the SAR aircraft. The SAR aircraft will continue along its course as the homer uses the voice energy until the pilot realizes that he has lost the signal, possibly as far as thirty miles away and has to come back. It is even possible that the pilot won't hear the downed flier's voice depending on switch positions in the aircraft and the audio chopping feature of the homer that renders speech unintelligible. The pilot usually has to switch to 243 MHZ guard chann to hear voice or check on the beac signal.

Rule No. 4. Only use the rad portion of the beacon with discretio Preferably wait until the SAR a craft begins to circle above you.

(This is contrary to USAF pr cedure which calls for shutting the beacon and going voice as so as possible. Canadian rules a based on their problems, which a different from those in the CONUS

The use of these four rules w assist in making your use of a beaco as "wise" as circumstances allo As they say in the adverts, they m give you the razor's edge at the ve time that you need it most. Th should bring you back for that be you contemplated prior to using t silken umbrella sooner than y hoped for. ■

THE PROFESSIONAL APPROACH

Q. If my aircraft is equipped with the newer AN/
RN-118(V) TACAN set, which incorporates a self-
st mode, am I still required to check the set for
ccuracy prior to takeoff?
Yes. The self-test mode of the AN/ARN-118(V)
ACAN set provides an operational test of the TACAN
t. The self-test does not, however, provide a test
the aircraft antennas. Therefore, all aircrews must
mplete all preflight checks in accordance with AFM
-37, paragraph 4-lm, regardless of type of naviga-
n equipment used.
May I circle from a PAR approach?
No. The Air Force does not permit aircraft to make
precision approach by radar (PAR) to one runway
d circle to land on another runway.
There are several reasons why a PAR approach is
t suitable for commencing a circling approach. A
cling approach usually is a non-precision ap-
oach and a pilot is authorized to descend to the
cling MDA after passing the final approach fix.
e PAR glidepath prevents the pilot from descend-
g to a circling MDA at his discretion in order to be
a position to circle when visual contact is estab-
hed. Also, during a PAR, the controller would
t know when to terminate glidepath information as
e circling MDA is not marked on the PAR scope.
is would not prohibit the use of azimuth position
a PAR to provide a surveillance approach to one
nway. In this case it should be noted that all
eages would be from touchdown rather than the
nway.
Guidance in the United States Standard for
rminal Instrument Procedures (TERPs) states
t the Missed Approach Point (MAP) for a precision
proach is a point where the Decision Height (DH)
ersects the glidepath. The circling approach
s no DH; consequently, a separate circling MAP
d associated missed approach segment would
ve to be designed into the precision approach to
commodate a circling procedure. This is an event
which TERPs makes no provision.
he final and perhaps the most important reason
not circling from a PAR is because circling
DAs are higher than precision DHs, and the
oretical precision circling missed approach point

AIR FORCE COMMUNICATIONS SERVICE
Scott AFB, IL

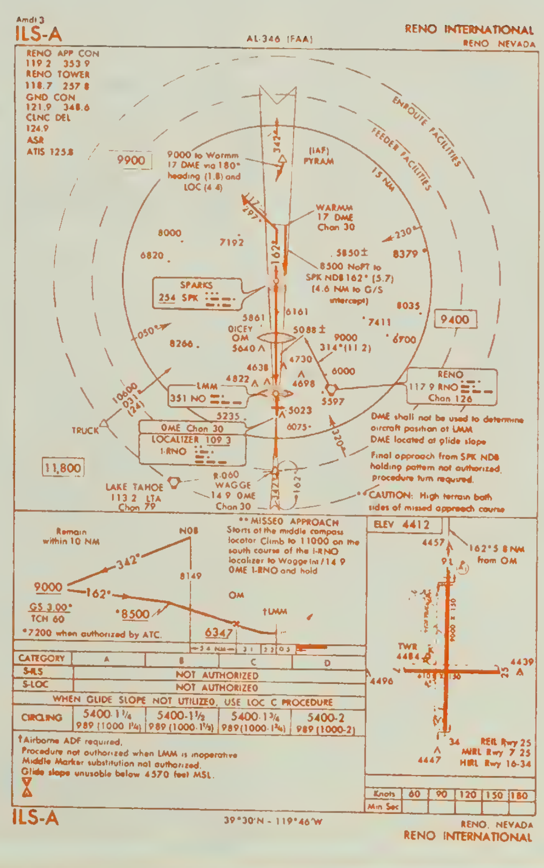
on the glidepath would be farther from the runway than the point where DH intersects the glidepath. Therefore, it is possible that an aircraft circling from a precision approach could begin to circle outside the circling obstacle clearance area. For these reasons, requesting/flying a circling approach from a PAR is not authorized.

Q. May I circle from an ILS approach?

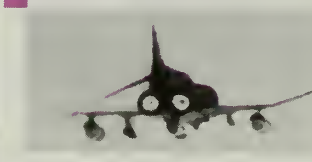
A. Yes. In fact, there are some approach procedures published which have circling minima only for an ILS (See ILS-A Reno International). Also, some procedures require the use of glideslope to fly down to circling minima due to obstacle clearance criteria. In any circumstance, be sure you are inside the obstacle clearance area for your category of aircraft before you start your circling maneuver.

Q. May I circle from an ASR approach?

A. Yes. There should be no special problems here. If the En Route Supplement lists minima then all you have to do is listen to the controller and fly. The controller will have to be advised of your aircraft category when the surveillance approach will terminate in a circle to land maneuver. ■



OPS topics



MTR Charts

■ Until recently, the DOD FLIP AP/1B chart was the only aeronautical product that depicted military training routes (MTR). As a result, the MTRs never received the desired recognition from the civilian aviation community.

This is now beginning to change. The FAA has released an announcement that accompanied the first edition of the IFR and VFR Wall Planning Chart (a joint civil/military product) on which MTRs are now depicted. It is the second of a three-phase FAA plan to publish MTRs on three separate civil products: (1) IFR Low Altitude Enroute Charts, which began December 23, 1978; (2) IFR and VFR Wall Planning Chart, on June 14, 1979; and (3) the Sectional Chart beginning in the near future.

Case of the Missing Cap

While a T-38 was holding for takeoff, the left engine compressor stalled. The crew couldn't find any pubs missing, but the copilot missed his hat and thought he lost it while driving to the base. Later, after the engine was shipped for inspection, remnants of a blue hat were found. Investigators believe the hat was in the copilot's pocket and hung up on the canopy as he boarded the aircraft. After engine start, the cap was sucked in.

Holy Cable Chewers

Last month in an Ops Topic on a fatal aircraft collision with a cable we said: " . . . the aircraft will always lose." Here's another episode, not fatal but guaranteed to yank the old pucker string. An F-4E on a low-level mission hit a cable which

- Shattered the front windscreen.
- Broke the front canopy.
- Nicked the bellows probe.
- Slid up and over the vertical stabilizer scraping off 2½ feet of paint. Whew!

RF-4C Windshield Break

Just after takeoff at 380 kts, 500 AGL, the RF-4C crew saw an orange flash off the nose. Then the pilot noted a cracked windshield. The center section of glass of the three laminated glass plates comprising the windshield center panel shattered. The outer layers remained unbroken. Where no definite cause has been established, the aircraft apparently was struck by lightning or there was a static discharge. The pilot saw a small rain shower about one mile left of track, but there were no other indications that supported a lightning strike.

Crew Light

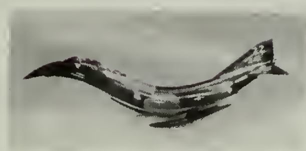
Steps are being taken to place the FA-11(M) crew light (featured on back cover of July 1979 *Aerospace Safety)* into Table of Allowances TA-016, as an aircrew personal retention item. The basis of issue will be one per crew member, and the stock number will be 6230-01-035-6077. Action should be completed some time in September. – Maj William Harrison, Directorate of Aerospace Safety.

A Slight Case of Windshear

During a practice la[...] ing by a KC-135 copil[...] the aircraft landed a [...] hard. The bounce cau[...] the left wing to rise. T[...] plus the runway crown [...] sulted in the number f[...] engine pod striking [...] runway. It appears t[...] there was a wind shear. [...] quote from the mish[...] report, "A weather fo[...] caster, who personally [...] served the tanker's h[...] left wing stated that [...] wind meter showed a [...] crease of 10 knots ste[...] statewind immediat[...] prior to the aircraft la[...] ing. It was also det[...] mined from the wi[...] chart recorder that a [...] degree change in wi[...] direction occurred wit[...] a three minute time s[...] just prior to the mishap.

A-7D Canopy Loss

During rollout on a [...] mation landing, the pi[...] of an A-7D opened [...] canopy at about 25 k[...] The canopy immediat[...] rose to where the hi[...] bolts and frangible l[...] failed as designated. [...] canopy was destroy[...] when it hit the runway.



ırbulence Encounter

Three persons were in-
ɾed when the aircraft in
ıich they were crew
d passengers encount-
ed severe turbulence.
ıe copilot, returning to
e jump seat received
ad and neck injuries,
other crew member a
ad injury and a pas-
ıger a broken arm. The
craft was at 27,000 feet
the vicinity of num-
ous thunderstorms.

ıder Oxygen

Hypoxia – the effect of
insufficient supply of
ygen. "Hypo" means
ınder" and "oxia"
ers to oxygen.

Who is most likely to
come hypoxic? Student
ots, you say? No! To-
/ hypoxic episodes are
re frequently reported
rated crew members
n students.

Fighter and attack air-
ft are more commonly
olved. But with gradual
s of pressurization in
mber and cargo air-
ft, hypoxia occasion-
/ hits the whole crew
fore someone recog-
es it.

n recent mishaps, a
elessness about per-
ıal equipment is evident. Oxygen connections have not been fully seated or checked. PRICE checks have been halfheartedly completed or omitted. Significant changes in oxygen quantity were not noted. Fortunately, the residual alertness of the crew prevented mishaps on these occasions – but it's just a matter of time.

The symptoms and tolerance levels of hypoxia vary for each individual. As a general rule, individuals who are not in good physical condition or who do not get the required rest will have less resistance to oxygen deficiency.

BUT THE MOST HAZARDOUS FEATURE OF HYPOXIA REMAINS THE GRADUAL AND INSIDIOUS ONSET. Its production of a false feeling of well-being, called "euphoria," is particularly dangerous. The hypoxic person commonly believes things are getting progressively better as he nears total collapse. – Capt James M. Fowler, Directorate of Aerospace Safety.

200 Feet is too Close

In a period of 10 days we had four reported near midair collisions with the miss distance estimated at 200 feet. At that distance and the speeds we fly, shear chance prevailed. Here are a few details.

■ A flight of T-38s recovering toward their base overhead pattern. During descent, after being cleared to 6,000 feet, Lead spotted a civil twin airplane at 12 o'clock, closing head-on. He called "Break" and the formation split. Miss distance estimated 200 feet. Identity of the twin was never established.

■ A C-130 was flying northwest for a visual approach and a left hand pattern for runway 16. Simultaneously, a Cherokee was approaching the pattern VFR, no Stage III, from the east. ATIS reported four miles in haze. The C-130 crew estimated three miles max. As the aircraft converged, Approach Control turned the C-130 over to tower. However, traffic was busy and there was a 15-20 second delay before tower replied. During that period the C-130 crew saw the Cherokee 200 feet ahead and pulled up in time to avoid a collision.

■ Think about this one. A flight of two F-4s passed a light twin going in the opposite direction. Both aircraft were at 17,500 feet. Miss distance: 200 feet. Until the instant they passed, the civil aircraft was hidden behind the canopy bow of the F-4 nearest him. Not until after the near miss did the twin begin squawking.

■ A B-52 on a low-level simulated bomb release run saw a Cessna 172 at 12 o'clock. The B-52 pilot immediately pushed over and flew under the Cessna, missing it by less than 200 feet.

Defensive flying is the name of the game. Some defenses:

■ Eyes outside, continuous scan.

■ Ask for traffic if on a visual approach.

■ Keep a high profile with landing lights on.

■ Reduce airspeed in high traffic areas. ■

Survival Working For You

SrA VINCENT E. DENNIS • Field Training Section 3612CCTS • Fairchild AFB, WA

■ As soon as I had recovered, I examined myself for injuries, found none, inventoried the items I had and took stock of the items in the survival kit. I was down in a wooded area in central Alaska. The snow was 3-to-4 feet deep and the temperature was below 0°, so I put the radio and battery inside my layers of clothing to keep them warm. I readied my flares for firing and placed them where I could easily find them. It was 1300 as I scouted the area for a shelter site.

Because of the site, depth of snow, and lack of immediately available materials necessary for other shelters, I began to build a lean-to. Also, building the lean-to would take less time and energy.

1430, 20 Dec 78 Stopped construction on shelter.

I gathered firewood for the night and next morning. Since the survival kit did not contain a flashlight, most of the work was accomplished during daylight hours or at night near the fire.

1530, 20 Dec 78 Completed shelter.

The materials used in construction of the shelter were poles, boughs, signal paulin, snow, and the shoe laces from my mukluks. I had to use the mukluk laces because of the lack of line in the survival kit. The only line with the kit was the 6′ lanyard which is used to secure the soft pack to the hard part of the kit. I used the line to construct an additional shelter, which I made from a signal paulin, by the fire area to keep snow from falling on my gear and me while next to the fire. Completed paulin shelter about 1730.

During the remainder of the evening I melted snow, using the general purpose ration tins as my pot, made snares from snare wire found in kit, ate the rations, and drank warm water, while preparing plans for the next day.

I stored water in the water bag from the kit and then buried the bag in about a foot-or-more of snow. With the outside temperatures varying from 0°F to −28°F, the insulating quality of the snow prevented the water from freezing and proved to be a satisfactory way and means to store the water, instead of under my sleeping bag where it may have leaked.

I went to bed about 2030.

0800, 21 Dec 78 Woke up.

Warmed the stored water, drank coffee, ate soup and chocolate bar from the rations.

0830, 21 Dec 78

I scouted for an appropriate snare and signaling area. The area didn't have many game signs; however, I found a good squirrel trail and set my snares.

Located a good signaling area about 200 yards from my camp ar decided to construct an "X" for a signal. The job took four hours. Each leg of the signal was a trenc in the snow, approximately 18 fee long and 3 feet wide, which I framed with boughs. The signal w extremely hard to construct due to the 3-to-4 foot snow depth. Extra line in the survival kit would have allowed me to improvise a set of snow shoes which would have cut down the time and effort put into constructing the signal. I melted more snow using the ration tin anc ate a meal consisting of a ration b cocoa mix, and soup. The ration bars were consumed unprepared. Additionally, I drank warm liquids

Next, I started drying out my clothing. Because of the design of the insulated flight suit, I was unable to take off layers of clothin to reduce sweating. Unzipping the flight suit allowed snow to get

side and melt. Working at a wer pace would have helped, but at wasn't practical with the ount of daylight remaining. I uld have saved a lot of time and uble if I had several layers of thing instead of the one layer of ilted material.

1330, 21 Dec 78

I gathered firewood and made provements on my shelter. For tter insulation, I increased the ow level on the shelter and put re boughs on the bough bed ich was approximately 6 inches in oth after being compressed. The cuum-packed sleeping bag worked ll when it was fluffed and air ed daily. Due to the lack of terials, I used my seat kit for the or plug. My shelter kept me nfortable at the 0°F to −28°F side temperatures.

430, 21 Dec 78

checked snares, melted snow in ration tin, and ate ration bars.

530, 21 Dec 78

Decided that melting snow was w work, so why not construct a ter machine which is nothing re than a tripod or bipod to which orous bag, in this case my T-t with the arm and neck openings sed off, is filled with snow and g near the fire. The heat melts snow, the water drops into a tainer placed below the bag.

The second evening was spent lting snow, storing the water, and mulating plans for the next day.

800, 22 Dec 78

Voke up, warmed water, drank fee and cocoa, and ate soup.

0930, 22 Dec 78

Close to the strip signal, I started constructing a "log cabin" type smoke generator and covered it with boughs. I placed matches and a MK-13 flare by the generator for lighting and coloring of the white smoke. After the generator was prepared, I cleaned off the snow, which had accumulated during the night on my strip signal.

1200, 22 Dec 78

I sighted an HH-3 in the area and tried to make contact using the PRC-90, but I didn't receive a response. However, I directed the helicopter to make a turn toward my position, and he responded to my request, so I continued the vector. During the vector, I lit the smoke generator; however, due to the high winds, the smoke didn't rise off the ground. The smoke did aid the helicopter during the pickup by depicting wind direction at ground level. Rescue's first voice communication wasn't until they were directly over my position. The rescue pickup device was coming down to me; it was all over. "I made it!!!"

This was only an exercise, but the "survivor" learned some things you may be able to use. The author is a survival training instructor assigned to the 3612th Combat Crew Training Squadron at Fairchild AFB, WA. His problems were real, and his comments should make us all reflect on what we could have done with our gear.

Problems he encountered:

Clothing: The quilted insulated flight suit is extremely hard to dry. In order to provide lighter clothing for working, extra clothing should be worn under the flight suit or the flight suit should be constructed in layers. Also, all the pockets on the flight suit should have zippers. The pocket snaps have a tendency to pop open, thus allowing gear to fall out.

Lack of a flashlight in the 0-2's survival kit: Because of the long hours of darkness in the arctic area during the winter, there should be a flashlight in the kit. Working without a light is hazardous at best.

Lack of suspension line in the 0-2's kit: There should be a spool of heavy line to improvise equipment such as:

- Shelter construction.
- Water machine.
- Snow shoes.
- Sled to carry gear.

Are you aware of the contents of your survival kit? Do you know how to use each item proficiently? Preplanning and knowledge on your part may be the difference between success and failure. It doesn't take a survival expert to know what equipment he has and how to use it. Read the article again and apply your own knowledge of your equipment to the exercise. See if you can have "Survival Working For you." ■

birds and planes don't mix
(The BASH Program)

CAPTAIN JEFFREY J. SHORT • BASH Reduction Team Leader • Tyndall AFB, FL

■ The United States Air Force suffers over 1,000 bird strikes annually, about one-third of which cause significant damage. Since 1970, the Air Force has lost almost $79 million and several lives from bird collisions with aircraft. Most of our aircraft are powered by jet engines. This tends to increase damage because the aircraft moves faster and the engines are more vulnerable to foreign object ingestion than prop-driven aircraft.

The effects of high speed are important in understanding the bird strike problem; as aircraft speed doubles, the impact force *quadruples*. For years, the engineers assured the operators that the best way to deal with birds was to protect the various aircraft components. Impact forces were so great at high speeds, however, that it was nearly impossible to protect against bird strikes without losing aerodynamic efficiency. It then became necessary to reduce the bird strikes that cause the damage.

To resolve this problem, the Bird/Aircraft Strike Hazard (BASH) Reduction Program was developed. A BASH team evaluates local environmental and operational characteristics of Air Force bases and recommends techniques to reduce bird hazards, as well as hazards involving other animals such as deer, jackrabbits, and even earthworms. Each situation is unique and requires special attention; but the goal of each program is to augment air safety by reducing the hazards.

The BASH team uses proven and available methods and techniques for bird control at Air Force bases. The team defines the problem by identifying which bird species are causing the hazards and why those birds are attracted to the airdrome. Usually, the bird hazards can be reduced by modifying the airfield environment to make it less attractive to the birds, actively controlling the bird populations, or by changing the flight operations. The bird hazards at a base are relative, depending species of bird, geographical lo tion, season, weather, time of d air traffic, awareness, and ma other factors.

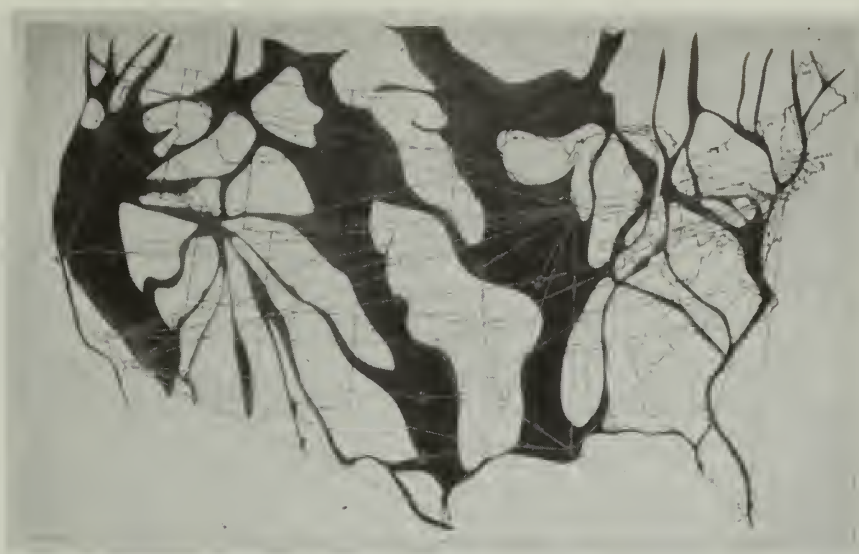
The BASH team is in an unus position: It is tasked with developi an effective program to reduce b collisions with Air Force aircra worldwide. The program is govern by a safety regulation (AFR 127- uses equipment owned by the Ba Civil Engineers, and is administe by Base Operations personnel. The are many problems in delegati authority, funding, and implementi this diverse program. Eventuall each installation will direct its o BASH program, relying on the BAS team to provide guidance on chro problems and develop methodologi to further reduce bird strikes.

When and where do most bi strikes occur? Based on 1,248 bi strikes from 1975-1978, there is sharp increase each spring and f as birds migrate through North Ame

Figure 1). The peak of bird strikes ie fall is caused by the higher num- of birds present after the breed- season. Most bird strikes occur ie traffic pattern within five miles he airdrome (Figure 2); 70 per- of these happen during takeoff. is substantiated by the number ird strikes to the engine and wing s of the aircraft (Figure 3). Also, n the BASH team recommenda- s are followed, damaging bird es have been reduced by 30 per- .

espite these statistical revela- , the Air Force still lacks suf- nt data base for analysis in de- ing programs to avoid birds in ow-level or enroute flight environ- ts, where almost half of the bird es occur. Birds are among the t studied "critters" on earth; habits are well known and pre- ble. Although the Air Force has mulated several years worth of about damaging bird strikes rted in accordance with AFR 4, the information is inadequate evelop a meaningful, predictive el to reduce bird strikes. More are desperately needed; this is a charge, however, to hit more , merely to record as extensively ossible the bird strikes that are dy available. All bird strikes are ntially damaging; but random ce determines where the bird the aircraft. Unfortunately, many hazards are not obvious until a mishap.

nce January 1978, AFR 127-15 required the quarterly reporting l bird strikes on AF Form 441. re AFR 127-15 was published, strikes were usually reported r the criteria of AFR 127-4 which ired the reporting of damage s in excess of $250. Thus, ap- imately 800 bird strikes went ported each year. Technically, bird strikes, damaging or not, d be classified as being a High dent Potential (HAP), Class C ap. HAP reports are used in de- ping and taking preventive ac- before they produce more seri-



A general view of bird migration patterns and main airline traffic routes.

ous results. Bird strike reporting could also fall under AFR 127-3, the Hazardous Air Traffic Report (HATR, reported on AF Form 651), since birds do present a hazardous flight condition and pilots often take abrupt evasive actions to avoid bird strikes. Much less time is required to report bird strikes on AF Form 441 and these data are much easier to retrieve than those required by these other regulations. Reporting only damaging bird strikes does not provide conclusive evidence of bird hazards because of the low number of reportable mishaps.

How long should bird strike reports be accumulated? The Bird Strike Committee of Europe (BSCE), an international organization concerned with solving the European bird strike problem, has allocated funds to compile 20 years worth of bird strike data. The BSCE has been in the vanguard of the bird strike program since the 1960s and must feel that such an extensive analysis is prudent, considering the complexity of the problem and the benefits to be reaped. The airspace over Europe is heavily traveled by USAF aircraft; and this information is vital to the BASH program. In addition to its application for predictions about bird hazards, documentation of bird strikes provides invaluable evidence

Figure 1

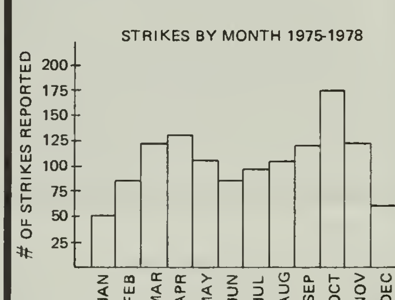


Figure 2

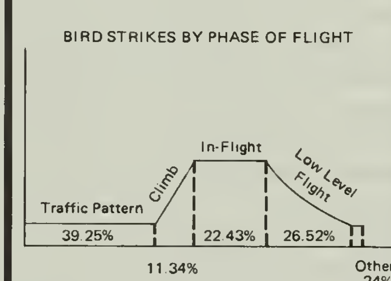
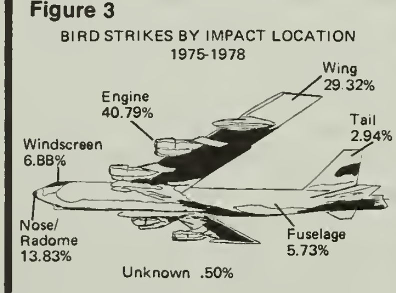


Figure 3



What was that thump?

Left—A helmet, visor and mask may be your only defense. Above, right—This feathered friend was large enough for an IFR clearance. Luckily, only minimum damage.

to oppose the construction of Sewage lagoons, sanitary landfills, or wild life refuges near Air Force bases. Consider this example:

An Air Force base (SAC) hosts several different types of jet aircraft, T-38s, KC-135s, B-52s, plus assorted transient aircraft with varying sensitivities to bird strikes. The base has reported 35 bird strikes over the last eighteen months in accordance with AFR 127-15, two of which were reportable under AFR 127-4 at a total cost of $41,000. A state wildlife agency plans to improve 6,700 acres which lie five miles from the final approach to the only instrument runway at the base.

The state fish and game expects an increase of 30-50,000 waterfowl as well as many smaller types of birds. The local community supports the plan because of the increased revenue. The bird movements will seriously impair flight operations when the birds are present.

The Air Force wants to continue its excellent community relations but hates to lose aircraft to birds. The community agrees that lives exceed the worth of a few more ducks in the freezer; and plans are made to change the area into nature trails using the small ponds that are already there.

The "wildlifers" help the Air Force reduce the bird strike hazards from their present levels: Another happy ending. Be assured that if the Air Force could just document two bird strikes, the results would be much different. In other words, reporting only damaging bird strikes can be used to document an expensive problem, while reporting all the bird strikes can be used to document a real problem.

BASH problems are like any safety hazards which must be assessed with respect to operational requirements, such as aircraft performance, severity of the problem, and training or readiness. During contingency operations or advanced stages of readi[n] bird hazards have minimal s[a] priority. The strategic mission o[f] Air Force is to fly and fight; the t[...] ing mission is to fly and fight, sa[...] While due consideration of bird [...] ards can degrade the training mis[...] a catastrophic bird strike deg[...] the strategic mission by wasting [...] able resources: Crew members [...] aircraft. ■

ABOUT THE AUTHOR

Captain Short is a graduate of the Univ[...] of Arkansas. He received his MS deg[...] Zoology, with a specialty in ornithol[...] ecology in 1975. He flew HH-1H helic[...] with the 37th Aerospace Rescue and Re[...] Service at Davis-Monthan AFB, Arizon[...] has been the BASH team leader since O[...] 1978.

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STATES AIR FORCE

Well Done Award

sented for

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professional

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and for a

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to the

States Air Force

dent Prevention

Program.

CAPTAIN

Douglas S. Higgins

91st Tactical Fighter Squadron

CAPTAIN

Miles A. Baldwin

81st Tactical Fighter Wing

■ On 20 December 1978 Captains Higgins and Baldwin, on a single-ship F-4D mision, were climbing through FL 260, when the aircraft rolled 25 degrees left, then rapidly to 30 degrees right bank. Captain Higgins countered the roll with both stick and rudder inputs. The aircraft required one-half to three-quarters left stick and partial left rudder to maintain wings level. An emergency was declared, and the aircraft was turned toward home base. Spurious roll inputs 15 to 45 seconds apart continued throughout the remainder of the flight. When a controllability check was made with gear and one-half flaps, at 210 knots the aircraft rolled violently, would not respond to control inputs, and was unloaded to zero G and accelerated to regain control. The aircraft was recovered at 6,000 feet as it was entering the cloud tops. A no-flap, 230 knot controllability check was successful; however, it was noted that only 10 degrees of right bank was available for safe turning at 230 knots. The radar approach controllers were advised of the limited bank control and requested to adjust their GCA pattern to compensate for the problem. The GCA was flown at 230 knots and the runway sighted at 3 miles. Touchdown was made at 230 knots. After passing the approach end barrier, they lowered the hook and successfully took the departure end BAK 13 at 70 knots. Both crew members were wearing full NBC flight gear for familiarization training. Throughout the emergency, communications were hampered by earphone problems with the NBC helmets. In addition, the face plates of both crew members fogged up numerous times, restricting their vision. They were able to clear the face plate fog by going to the test mask position on the oxygen regulator; however, at times it took up to 1 minute to clear the face plate. Captains Higgins and Baldwin demonstrated superior airmanship, judgment, and crew coordination by successfully recovering a valuable aircraft. WELL DONE! ■

BLUE FOUR...

Fatal Mishaps Are Increasing...

FLY SMARTER

See p 14

AEROSPACE

SAFETY • MAGAZINE FOR AIRCREWS

NOVEMBER 1979

IN THIS ISSUE:

you vs hydroplaning... AND THE WINNER IS?—

■ Take our little quiz and then check Slick Nick's comments and see how you did. The answers are at the end of the article. No peeking!!

1. (T or F) Hydroplaning is broadly defined as a condition of high coefficient of friction created between the tire and the runway surface.

2. Hydroplaning may be considered under three categories. Match the following appropriate items with the correct definitions below.

a. Dynamic c. Viscous e. Reverted Rubber
b. Hysteresis d. Hydrometer

I. _______ occurs only on runways that have a smooth surface texture or a runway surface made smooth by rubber deposits or paint.

II. _______ occurs when the tires are separated from the runway surface by water. The tire rides above the surface on a wedge or film of water and the fluid displacement drag eventually results in slowing and finally stopping rotation.

III. _______ heat generated by braking friction produces superheated steam at high pressure which is trapped in the tire footprint area. This causes the tire rubber to change back to its uncured state.

3. Under the three categories of hydroplaning there is one that is considered the worst because it can occur down to zero speed. Select one.

a. Viscous
b. Reverted rubber
c. Dynamic
d. Hysteresis
e. Hydrometeor

4 (T or F) There is no evidence that tire diameter directly affects the coefficient of friction available on wet or dry surfaces.

5 When anticipating a hydroplaning situation, without antiskid, braking technique is an important consideration. Select the most correct response.

a Apply and maintain maximum brake pressure as soon as the aircraft touches down.

b. Use intermittent braking by applying a smo moderate application followed by a short nonbraking pe to cool the pads.

c. Apply a smooth and steady brake pressure tryin maximize braking forces without locking the wheel causing a skid.

d. Refrain from using the brakes allowing the air to roll out. If the aircraft has not stopped by the 1,0 remaining marker, stomp on the brakes and attemp blow all the tires.

6. (T or F) In a total hydroplaning condition, an air can be expected to depart the side of the runway at a equal to the existing crosswind component.

7. (T or F) When a tire is in a locked wheel skid it ha cornering force. Cornering force is necessary to mai control of the aircraft on the ground.

8. The primary function of a tread pattern is to:

a. Improve cornering ability.
b. Give a smoother ride.
c. Increase the tire's service life.
d. Improve the tire's frictional properties on wet surfa

9. An aircraft that uses a deceleration chute as a b ing device has the potential to amplify the hydropla problem under what conditions.

a. Wet runway with a strong tail wind.
b. Wet runway with blown tires.
c. Wet runway with a significant crosswind.
d. Wet runway with a suspect antiskid malfunction.

10. (T or F) If you are fortunate enough to have a stat the-art antiskid system or engines equipped with rev thrusters, hydroplaning is no longer a serious concern

Well, how did you do? Slick Nick says:

11-12 right	One for the good guys, a TKO in the 10th doubt you know your stuff.
9-10 right	Split decision, better read my article.
8 or less	Check your wings and see if the bac stamped "dry runways only." Read my a and take notes!!

continued on p

NITED STATES AIR FORCE

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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you vs hydroplaning... continued

Let's examine the three types of hydroplaning: dynamic, viscous and reverted rubber. I have provided an example of each type by taking actual cases from the mishap files. First, an example of dynamic hydroplaning.

The day is dark, cold, and rainy; miserable unless you're a duck. The crew arrives and does an exterior and interior checklist. The ground crew assures the aircrew the pretaxi checks are complete, and the aircrew taxis out to make an on-time takeoff.

As they are rolling down the runway, both pilots notice their airspeed indicators are stuck between 55-60 knots although aircraft acceleration and engine power appears to be normal. Guess what, gang? The pitot covers are still on!! Well, a little pride at stake, but no problem, all they have to do is get on the brakes, right? Wrong! Dynamic hydroplaning has reared its ugly head. The pilot retards the throttles to idle, raises the speed brakes, and applies full brakes but there is little, if any, effect. End result, the aircraft leaves the runway and comes to rest after traveling 300 ft on an unprepared surface.

Under total dynamic hydroplaning, water pressures between the tires and the runway lift the tires off the surface. Under such conditions, a nonrotating tire will not spin up after touchdown and a tire that was rotating will begin slowing and may stop. The coefficient of friction is reduced to near zero, making braking, cornering and steering ineffective.

Dynamic hydroplaning problems can be aggravated by crosswinds and drag chute deployments as illustrated in this recent mishap. An F-4 was making an approach in heavy rain and a crosswind. Touchdown was on centerline and the aircraft was tracking straight ahead. The pilot deployed the drag chute and the aircraft sharply swung to the right and began drifting toward the edge of the runway. The pilot, reacting quickly, effected full left flight control inputs, used differential thrust, and jettisoned the drag chute.

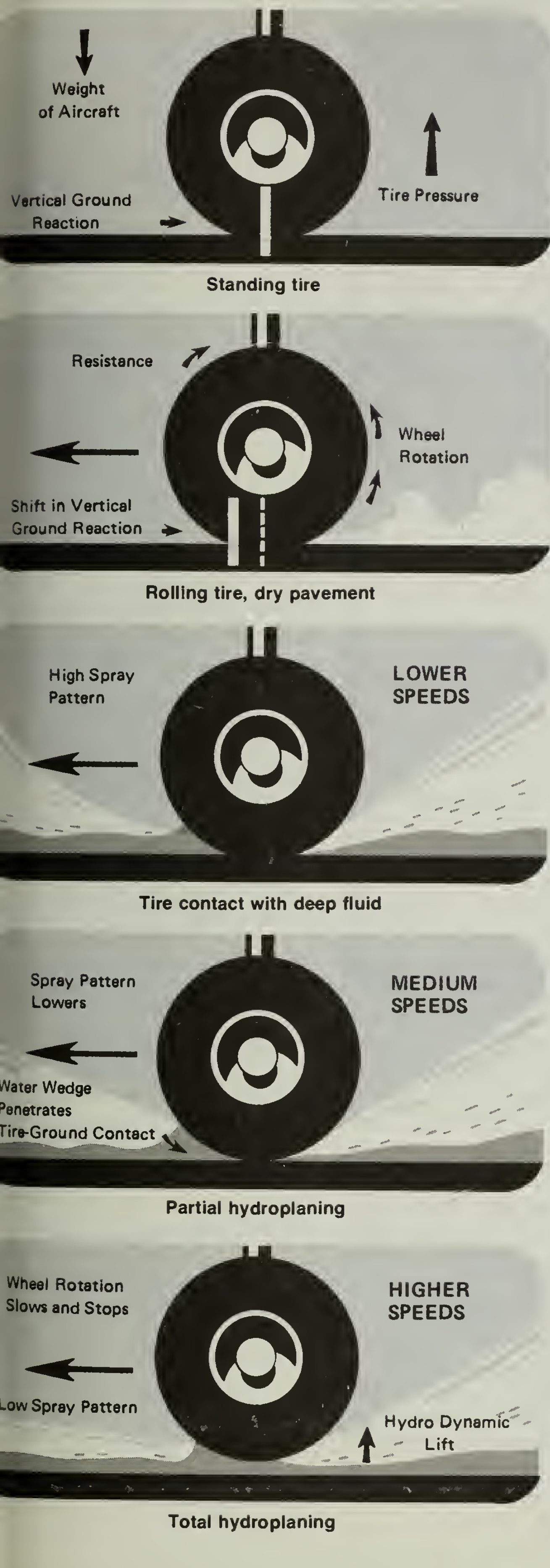
The aircraft's skid was stopped, the aircraft returned to the centerline and the remainder of the landing roll was uneventful. The pilot's quick analysis and timely action averted a major mishap caused by good ol' dynamic hydroplaning. Let's move on to viscous hydroplaning.

The mishap aircraft was scheduled for a single-ship instrument training mission. Approximately 20 minutes after takeoff, the pilot received a weather recall due to heavy rain approaching the base from the South. He returned to the base and made a normal landing just before a heavy rain shower reached the south end of the airfield. He turned off the runway, completed his checks, and then was cleared back on the runway (now inactive) to taxi to the parking ramp. By this time the heavy rain shower had reached midfield along with gusty winds. When the pilot attempted to turn off the runway and into the parking area, the aircraft began an uncontrollable skid. The aircraft departed the prepared surface, collapsed the right main gear, and damaged the wing and tail section.

Viscous hydroplaning occur runways that have smooth su texture, significant rubber dep or certain types of paint. A ti these surfaces can only partially place the trapped water film. N I'm saying film, it doesn't take moisture, even a light dew can viscous hydroplaning given the smooth runway surface. Reco of tire braking and cornering a is speed dependent so. . . . On runways or taxiways exercise ca and keep your speed down attempting turns.

The last category of hydropla but certainly not the least dange is reverted rubber hydroplanin this particular case, the mishap craft started with dynamic hydro ing and ended up with reverted ru hydroplaning.

The aircraft touchdown was no and in the first thousand feet. pilot tested the brakes at app mately 110 KIAS. The brakes mediately locked up due to the slick runway (dynamic hydro ing). As the aircraft's speed decr and the effects of dynamic hydro ing were lessened, the tire began ing up due to the friction incr Soon a layer of steam develope tween the tire and the runway. rubber reverted to its natural state and formed a seal to pr water dispersal. The tire was r on a bubble of superheated stean molten latex.



The operational antiskid did not recognize the aircraft was in a skid and, therefore, did not provide any assistance. Even though the pilot attempted numerous techniques to regain control of the aircraft, it finally departed the runway causing aircraft and runway lighting damage.

As long as the wheels are locked, directional control is lost. The pilot has to get off the brakes, get the tires rotating once again and regain cornering ability. Then he can effectively use nose wheel steering and/or aerodynamic controls, plus he can use the brakes again to stop the aircraft. Reverted rubber hydroplaning is the most dangerous because it can occur down to zero speed.

Progress is being made on the problem. Such things as runway groving and cleaning, tire tread design, using paints that resist viscous hydroplaning, better antiskid systems, and aircrew education are lessening the hazard. You, the crew member, can enhance your chances in beating the big "H" by:

- Understanding the mechanics of hydroplaning.
- Reading and heeding your flight manual.
- Planning your landing or takeoff to avoid as many of the contributing factors of hydroplaning as possible. For example, if rain is present and dual runways are available, one is grooved and one is not, and either one is adequate considering your takeoff performance, select the grooved runway.
- Anticipate hydroplaning problems when landing or taking off on wet runways.
- While taxiing use extreme cau-

You've heard of reverted rubber hydroplaning. Here is how a tire look after the tire has been riding on a bubble of superheated steam and molten latex.

tion. Slow, smooth turns are recommended.

▪ The best braking technique is to apply a smooth and steady pressure trying to maximize the braking forces without locking the wheels and inducing a skid. Braking research has found intermittent braking serves no useful purpose because the periods between brake application produces light or negligible cooling.

▪ In a potential hydroplaning situation, a firm landing is preferred over a grease job, since it will do a better job of getting the tires rolling on the paved surface rather than skidding on the water.

▪ Be aware of crosswind and its affect on hydroplaning. If you fly an aircraft using a drag chute, know the hazards associated with crosswind when dealing with wet runways and crosswinds.

▪ Know the limitations of your antiskid system when dealing with the three types of hydroplaning.

▪ Hangar talk with squadron IPs and Wing Stan Eval pilots. Get their impressions of the aircraft's susceptibility to hydroplaning the best techniques to employ cover the aircraft. ■

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Answers:
1. F
2. I.c.
   II.a
   III.e.
3. b
4. T
5. c
6. T
7. T
8. d
9. c
10. F

CING--
rethought

:APTAIN JAMES S. KASH
4th Flying Training Wing/SE • Columbus AFB, MS

Just because you do not see icing, it loes not mean that you are not experiencing it.

Aircraft icing to most pilots is iought of in terms of clear, rime or rost and light, moderate or heavy. Iost pilots must refer to the IFR up or *Weather for Aircrews* manual spurt out accurate definitions of ing. One thing is certain however, lots know you need visible oisture (clouds) and freezing mperatures to experience icing. nother thing pilots know is that the rst place where ice usually starts rming is on the windscreen (or indshield wipers for heavy ivers), and this visual indication ually precedes cockpit ice warning ghts.

Despite these commonly held eliefs, there is another form of ing not defined in the IFR Sup nor eceded by visibly detectable rframe icing. I am, of course, ferring to inlet duct icing. Pay ose attention to the following facts d be aware you do not have to ink winter to experience this ienomenon.

NASA's Lewis Research Center ports that the conditions that oduce turbine inlet icing are sible moisture from ground level 15,000 feet and temperatures om −5 to −18°C. The exception this is cumulonimbus clouds iich can cause inlet icing as high 40,000 feet. Engine and inlet ng builds up fast and can occur fore an accretion of ice is visible on the aircraft surface. This situation is most likely at high engine rpm and low flight speeds associated with takeoff, penetration, and approach.

Also consider that maintenance specialists use an air temperature of less than 40 degrees F. and a temperature and dew point spread of less than 7 degrees as a guide not to run engines on the trim pad due to the possibility of ice formation. Therefore, the possibility for induction icing to occur below the freezing level does exist.

The situation presents itself during the fall and winter months during GCA patterns with an overcast and temperatures near freezing, even though the clouds may actually be below the freezing level. Another weather phenomenon which may provide conditions right for induction icing is heavy to moderate rain showers.

A T-38 cruising at 6,000 MSL with the freezing level reported between 10 - 12,000 feet experienced a dual engine flameout on landing from ice ingestion. The crew reported at no time entering what they thought were icing conditions (that is, temperature below freezing and seeing accretion of ice on the airframe); however, maintenance investigation revealed that engine damage and subsequent flameout was caused by icing.

Weathermen report that during heavy precipitation the OAT may be lowered as much as 10 degrees due to the cooling effect associated with the falling water. So, even though below the freezing level, conditions for icing may exist.

What is the danger associated with induction icing? First of all, the pilot isn't aware it is happening. Secondly, for non all-weather aircraft without anti-icing equipment the danger may be fatal depending on when the icing occurs.

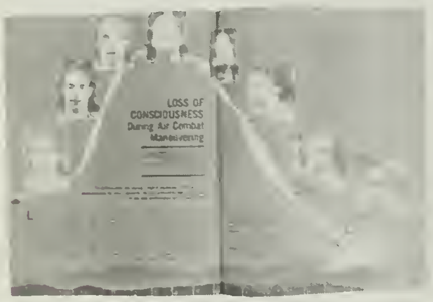
Talon Service News, Oct-Nov 78, describes what the result of engine icing may be. "Ice particles dislodged from the air inlet duct lip and/or inlet guide vanes can cause foreign object damage. Ingestion of dislodged ice particles into an engine may be evidenced by increased vibration or unusual noise from the engine. Normally, this FOD will reduce the stall margin but not cause engine failure. However, be alert for a possible compressor stall, when increasing power. Engine instrument indications may remain normal, even though the inlet guide vanes and first stage compressor blades have been damaged.

A senior maintenance engine specialist says, "I've inspected over 1,000 engines with ice damage, and not a single one was written up for possible induction icing."

So, what tips can the pilot use? Obviously, don't forget or discount all you know about structural icing and the icing limitations for your aircraft. In addition, be aware of the conditions in which induction icing may occur. Be especially aware that the takeoff and approach phases of flight, with slow airspeed and high power setting, are conducive to induction icing when atmospheric conditions are proper. Don't forget that, just because you cannot see structural ice forming, you are safe. Try to remember the conditions under which induction icing may occur—it may save your life. ■

Loss Of Consciousness In High Performance Fighters

(What To Do About It)



MAJOR PETER R. Nash
Chief, Aerospace Medicine
USAF Hospital
Davis-Monthan AFB, AZ

■ The problem is that our new generation fighters with their low wing loading, high thrust to weight ratios, and rapid G onset rates have exceeded the ability of the human body to withstand positive G loads. All crew members of high performance aircraft are familiar with such G-induced symptoms as grayout and blackout (loss of vision) which are caused by a significant reduction of blood flow to the head. A pilot will normally respond to these symptoms of excessive G loading by slightly relaxing the Gs so that he can maintain vision. However, if a crew member is subjected to a sufficiently high +G load, especially if it is of very rapid onset, the usual warning signs of grayout and blackout are bypassed and LOC can occur. Loss of consciousness is obviously extremely hazardous because situational awareness and physical control of the aircraft are completely lost. In addition, research on LOC in the human centrifuge has revealed two important and disconcerting facts:

1. Following a LOC there is a period of complete incapacitation.
2. The subject who experiences LOC does not remember the episode.

The incapacitation which follows a LOC averages 15 seconds and the possible consequences of such an event occurring at low altitude and high airspeed are obvious.

The amnesia which has been shown to occur on the centrifuge i important because it is possible th LOC could occur and the pilot no recall the episode. He might remember only a vague sensation something being wrong. If he did find himself in an unusual attitude and not know how he arrived ther he might realize that something unusual had happened, but becaus of his fear of grounding, the episo might not be reported to his supervisor or flight surgeon. The combination of amnesia for the event and fear of grounding has probably caused an under-reportin of the actual number of LOC incidents.

We now come to the big question – does LOC occur in flig The answer is YES. In the past tw years there have been several case both documented and undocument in which LOC has occurred in flight. The majority of cases have involved the F-15, but there have been other suspected episodes in t F-4, F-106, and even an OV-10! The typical episode occurred duri ACM when the pilot suddenly acquired a target and initiated a h turn. The next thing he knew he w in a nose low attitude and had no idea how he arrived there. In som of the episodes, the pilot later discovered that his G suit hose wa not connected. Fortunately, the aircraft were recovered in all case and no accidents are known to ha occurred as a result of LOC in flight. But the potential for disaste is definitely there. In addition, a LOC in combat would make the aircraft a "duck" for approximate

15 seconds.

The obvious solution for LOC is to increase the ability of the pilot to withstand rapid onset, high G loading. This can be done through conditioning and training of the aircrews, and better life support equipment.

Because human G tolerance is dependent on many factors, a pilot can improve his G tolerances through several means:

1. Such things as proper rest, nutrition, and not flying when ill are obvious.

2. Because G tolerance is partially dependent on an adequate circulating blood volume, avoidance of dehydration is essential. Dehydration can be prevented by adequate intake of fluids and salt, avoidance of excessive alcohol and coffee intake, and a period of acclimatization when operating in a high temperature environment.

3. All aircrew members should receive periodic refresher training in the performance of a proper M-1 maneuver. Most pilots receive this training during UPT and subsequently receive little or no refresher training. Ideally, such training should be performed on a centrifuge because experienced fighter pilots who have received refresher training on a centrifuge have stated that the training did improve their G tolerance.

4. Exercise. Recent studies have shown that running does not significantly improve G tolerance but weight lifting, especially exercises designed to strengthen the abdomen, upper arms, and upper legs can increase G tolerance. Running or some other form of aerobic exercise should be continued as part of an exercise program because of its other beneficial effects.

5. Pilots should carefully ensure that their G suit hoses are properly connected and recheck them periodically during flight. In addition, pilots and life support personnel should ensure that the G suits fit properly and are readjusted if there is a weight gain or loss.

6. IPs and WSOs who fly in the back seat of fighters are especially vulnerable to LOC because they sometimes have no warning of high G loads. Therefore, they should be especially alert for such situations.

At the present time, life support equipment specialists and engineers are in various stages of evaluating and testing methods to improve G tolerance. Some of these are:

1. A High-Flow Ready pressure valve which provides for more rapid inflation of the G suit. This is currently being tested in F-15s.

2. Reclined ejection seats.

3. Design of a cockpit which provides elevation of the pilot's legs.

4. Positive pressure breathing.

Finally, a pilot can prevent LOC by flying his aircraft properly—make all control inputs smooth, be aware of your G level, and be alert for Mach tuck.

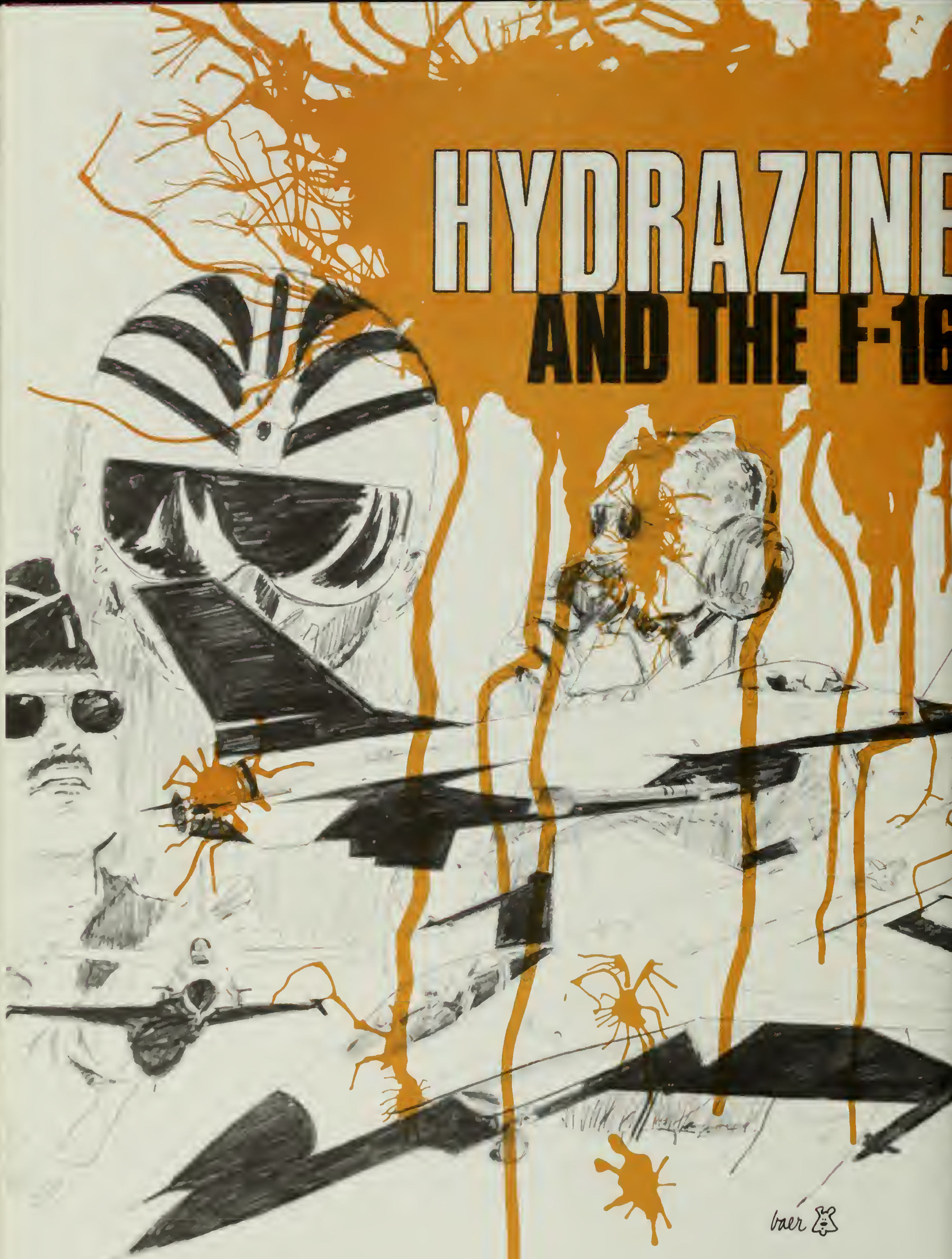
In summary, G induced LOC is a very real problem with the potential for disasterous consequences. But by proper training and awareness the problem can be avoided. The goal of increased G tolerance is not to make everyone capable of pulling 10 Gs all day long (maintenance already has enough problems with over Gs), but to increase a pilot's G tolerance so that he can withstand unexpected and rapid onset G loads. In addition, increased G tolerance will enable the fighter pilot to fight more comfortably, with less fatigue, and with better vision (you can't fight somebody you can't see).

Good luck and happy hunting. ■

ABOUT THE AUTHOR

Major Nash was severly injured in a combat mishap several years ago while serving as a pilot in the Air Force. He spent a year in the hospital and decided to become a doctor. Major Nash graduated from medical school, then reentered the Air Force. He has been reinstated as a pilot and is now flying the A-10.

HYDRAZINE AND THE F-16



IAJOR WARREN D. TUTTLE
'SAF, Ret.

I The use of hydrazine in the F-16 mergency power unit (EPU) has aused a lot of concern among those f us who may become exposed to the ubstance. True, it is a hazardous ropellant and can cause severe harm o the old bod if prolonged exposure ccurs. But let's face it, gang—as long s we know it's bad stuff we're not oing to hang around and smell it— r are we? The guys and gals who ork with the F-16 and its subsystems e well versed on the hazards of hy- azine—but what about the people installations that may occasionally cover an F-16?

After a great deal of debate on imerous hypothetical scenarios, veral facts soon become apparent:

- While probability of a hydrazine ak is very remote, it will occur entually at some non-F-16 base.
- The impact, even under worst se situations, on personnel or prop- ty, will be minimal if a few simple ecautions are exercised.
- The pilot must be thoroughly ac- ainted with the appropriate re- onse if his plane springs a leak.

Rather than read a dry dialogue the why, where, and what to do, t your basic common sense on the llowing situational questions. While ch question is aimed at a specific ty position, knowing what those ople should do certainly expands ur smarts as well. Remember— F-16 EPU contains 6.8 gallons hydrazine mixed with water; the ff is toxic when inhaled or absorbed ough the skin; it has an odor like monia; and it can corrode materi- (like aircraft components, may- ?).

You, an installation commander (or airport manager), want to be properly prepared when, and if, an F-16 lands. You should

a. Develop an emergency F-16 response plan and practice it quarterly.

b. Instruct the supervisor of flying to close the runway if there is an F-16 in the area.

c. Tell your recovery crews to treat the F-16 like any other aircraft unless the EPU has been fired and, in that case, listen to the pilot when in doubt.

d. Procure the necessary equipment to cope with a potential hydrazine spill at your base.

A: The best approach is answer c. While a response plan may be a slick idea, a hydrazine spill is not different from any other hazardous chemical spill, and these plans should have already been formulated. If you have access to household bleach (the grocery store), clean rags (linen supply), a self-contained breathing device (the fire department), rubber gloves (the grocery store again), and several big plastic garbage cans (back to the grocery store), you have all the equipment you need. The probability of a hydrazine leak occurring when the EPU has not first been fired is so remote that it need not be considered here.

Q: You, an F-16 pilot, are doing your thing when the EPU activates. You should

a. Go to 100% oxygen immediately.

b. Give the old Omega Sierra mumble, level the wings, and punch.

c. Land immediately at an airdrome with an adequate runway.

d. Evaluate the situation and decide whether to land immediately or press on to an F-16 base.

A: This is kind of a toss-up between c and d. The other two answers just won't cut it. If there is any doubt as to the sustained airworthiness of the ship, don't search for an F-16 base; get it on the ground.

Q: You, an F-16 mechanic, are removing the hydrazine cylinder after the EPU has fired when a couple of drops of hydrazine bubble out of the quick disconnect. You should

a. Declare a hydrazine spill, clear the area, and notify the base bioenvironmental engineer.

b. Check to see if anyone was looking and wipe the hydrazine up with a clean rag.

c. Forget it.

d. Spray the EPU compartment with a bleach decontaminating solution.

A: The best response is b. Release of a couple of drops of hydrazine is expected when the quick disconnect is uncoupled; therefore, it is not considered a leak. The reason you would look to see if anyone was watching is because you forgot to place the clean rag under the disconnect before you pulled the lines apart. After wiping off the hydrazine you should thoroughly clean those areas contacting the hydrazine with water.

Q: You, a transient alert crew member, have just parked an F-16 which had an in-flight EPU firing and notice some clear fluid dripping from the fuselage onto the ramp. The first thing you should do is

a. Advise the pilot, then clear the area.

b. Confirm the substance by giving it the old taste test.

HYDRAZINE AND THE F-16

continued

c. Put a clean drip pan under the leak.

d. Instruct Airman Jones to plug the leak with his finger until help arrives.

A: While it would be wise to use a drip pan to contain the leak, the best maneuver at this point is answer a. We don't expect transient alert people to be completely proficient in hydrazine procedures. The most accessible individual who will be up to date on these matters will be the pilot. He should be the authority to advise on the best way to contain any leak that may evolve.

Q: You, an F-16 pilot, have recovered your aircraft at a strange base following an in-flight generator failure. The ground crew advises that you are dripping some stuff all over the runway. You should

a. Tell the ground crew to get the fire department to hose down the ramp.

b. Confirm the fluid is hydrazine by using your handy dandy litmus paper (readily available from the aircraft forms).

c. Top off and split.

d. Check the bold print instructions in the Dash 1.

A: The first thing to do is to be sure the leak is actually hydrazine. This can be done as stated in answer b. Believe it or not, we are trying to get litmus paper strips in the F-16 aircraft forms. In leaks we have experienced in the past, small drips of hydrazine usually accumulate around the drain port of the EPU compartment. By simply rubbing the litmus paper around the port, the pilot can readily confirm or rule out a leak.

Q: An F-16 with an activated EPU lands at your base when you are on transient alert duty. You, the transient alert troop, smell an ammonia odor and notice some fluid dripping from the EPU compartment. You should

a. Tell the pilot and immediately seek medical assistance.

b. Lie down so you won't hurt yourself when you drop dead because you have had it, buddy.

c. Advise the pilot and clear the area.

d. Locate the nearest emergency shower.

A: While hydrazine is a very hazardous substance at high concentrations or when exposure to low concentrations occurs over long periods of time, neither of these situations should occur when an F-16 EPU develops a leak. The only time we would recommend medical attention is if the fluid is actually splashed on the exposed skin; and if that occurs, the first order of business is to wash it thoroughly with copious amounts of water. If you smell the hydrazine, the best thing to do is answer c.

Q: You, the installation commander, have been told by the pilot that his EPU has a confirmed hydrazine leak. You should

a. Mobilize your disaster response force for chemical spills.

b. Request your bio guy (if you have one) assist the pilot in assessing the situation.

c. Request the fire department provide self-contained breathing devices in case they are needed by people containing the spill.

d. All of the above.

A: Since no AF quiz is complete without at least one answer being "all of the above," this is a good place for it. A really concise plan cope with these events is nice but m be unworkable. The best pursuit is know the concept and be flexible.

The disaster response force w have the people to contain the le This will be done under the directi of the pilot or other competent a thority. The bioenvironmental en neer will be extremely valuable determining the extent of the relea and advising on environmental co cerns.

The people performing the co tainment may require respiratory p tection and impervious gloves depen ing on the magnitude of the haza After the leak is contained, the n step is to advise the home base come and clean up their mess.

While the above questions m not cover all the requirements wh a hydrazine incident occurs at a no F-16 base, they touch on most them. ■

FLYING 'MAPLE FLAG'

By DAVID HEALY (HQSTC Public Relations)

AF crews have been receiving realistic training in such exercises *Red Flag* on the Nevada desert. Some have been receiving different experience over the snow, and forests of Canada in Exercise Maple Flag. This article tells about it.

A hundred and fifty feet above the tops, the crew of an RAF Bucca-r spotted a pair of moose wander-through the Canadian silver birch est—and at 450 knots, it was no e than a fleeting glimpse. But the ot and navigator were not par-larly interested in the flora and na of the Alberta countryside at moment; they were more con-ned with avoiding the predatory 5 Eagle and F-4 Phantom fighters ch they knew were in the vicinity nd with trying to miss the missile antiaircraft artillery sites that ed the terrain with heart-jolting uency.

ight Buccaneers from Strike nmand's No. 208 Squadron were ng part in Exercise Maple Flag ee, being detached for that pur-e to the Canadian Forces Base Cold Lake, Alberta. The aircraft returned to their base at Honington, in May. Most of the aircrew and groundcrew involved were selected from 208, but some aircrew taking part from No 15 and 16 Squadrons from RAF Germany.

Maple Flag Three follows two earlier experimental exercises run from Cold Lake, and is the first of a series of realistic combat training exercises designed to run at a rate of two a year. An offshoot of the well-publicized *Red Flag* series held in the United States, *Maple Flag* is in fact largely American in its operation. Although the Cold Lake Base Commander is in control, personnel from the *Red Flag* staff at Nellis Air Force Base, Nevada, provide the exercise planning and the inputs.

Apart from the RAF Buccaneers, a wide variety of aircraft were taking part. The American contingent consisted of 35 aircraft from the USAF and the US Navy, including F-15 Eagles, F-4 Phantoms, F-5E Tigers, Starlifters and helicopters—which doesn't include the B-52s, FB-111s, E-3A Sentry aircraft and KC-135 tankers operated from their own bases in the States. The Canadians provided 24 aircraft, with CF-104s, CF-5s, CF-101s and various helicopters. Also taking part were their CF-100 and Falcon electronic warfare aircraft.

Red Flag and its offspring developed from the Americans' discovery that the first ten combat missions were by far the most hazardous for an aircrew. After completing those, the chances look much healthier from a life insurance point of view. In American terms, the "survivability rate" increases. The solution to the problem was to provide realistic

training which would simulate combat conditions.

With the "Flag" exercises, the idea is to make the course as realistic as possible for the participants, giving aircrew the chance to learn how to deal with threats from the ground and from the air — and how to get through to their targets. Imagination and initiative are encouraged, but a balance has to be struck with the need for safe flying. Areas such as the Nevada desert and the forest and muskeg of Canada pose less of a problem for military flying than in densely-populated Europe, but it is still, after all, a peace time situation: in war, aircraft would fly lower and faster.

CFB Cold Lake is a relatively new base, dating from the 50's, and has modern hangars and facilities. Its two parallel main runways, served by extensive concrete hardstandings, are rarely out of use during the daytime — Cold Lake is the largest fighter base in Canada. Dubbed "The home of fighter weapons," it is the base for 417 Tactical Fighter/Operational Training Squadron with CF-104s, and 419 Tactical Fighter/Training Squadron and 434 Tactical Fighter Squadron with CF-5s.

The Cold Lake Air Weapons Range, situated north of the base, is about 100 miles long by 40 miles wide. As the Buccaneer crews found out on their first acquaint flights, it consists largely of silver birch forests, lakes — many of them still frozen in June — and very little in the way of hills. One pilot commented: "It's like East Anglia — only flatter." The lack of hills causes some problems for low-level flyers who normally aim to keep below the hills, and calls for a different kind of skill. A camouflaged Buccaneer, for example, is not difficult to spot if it flies over the middle of a large, frozen lake.

Dotted through the range are targets and threat sites, with dummy tanks in clearings and a simulated airfield hacked from the forest with derelict aircraft strategically parked.

One of the immediate differences from *Red Flag* which aircrews not is the difficulty of locating cam flaged sites amongst the trees foliage compared with the arid de and mountains of Nevada. At moment, the majority of the C Lake targets do not have scoring cilities or much of the sophistica electronics associated with Red Fl USAF helicopters flew in some el tronic threat simulators for this ex cise, but changes are planned wh should dramatically improve the cilities up to Nellis AFB standar

Weather conditions at Cold L are favorable most of the year, desp the intense cold which freezes lakes and rivers to a great depth some of them solid. Even in late Ap Cold Lake itself had three feet ice, enabling local fishermen to dr out to their favorite spots by tr before cutting a hole for Eskin style angling.

Alberta's fortunate discovery vast quantities of oil beneath sparsely-populated surface h caused some problems for the C

adian Forces with the Cold Lake inge. Some areas have been opened p for oil extraction, and that means iat aircraft have to try to avoid ianned sites. The Canadian Forces ithorities have agreed not to re- ase projectiles within six miles of anned sites, and within one mile of imanned sites.

As in *Red Flag*, the exercise starts ith a ''composite'' strike mission hich involves large numbers of air- aft on sorties that include interdic- on, recce, combat air patrol, escort, id suppression of electronic war- re threats.

The attackers, with their CAP ver, form the ''Blue'' forces, iile their adversaries are ''Red.'' om mission to mission, aircraft e switched from one side to the ier, which calls for a high degree flexibility. In addition, exercise outs include the sudden changing plans in the middle of a sortie – ch as the changing of a target.

''Aggressor'' squadrons of fighters use eastern-bloc tactics to break up the attacks; it is interesting to see some Canadian CF-5s sporting similar Soviet-style camouflage to their USAF counterparts in F-5E Tigers.

Search and rescue missions are also flown during the exercises to rescue ''downed'' flyers from earlier sorties; these unfortunates are selected from those deemed to have been shot down and are flown out to the range to be picked up later, hopefully, by fighter-escorted SAR helicopters. (One Buccaneer pilot imagined having to describe his surroundings to a would-be rescuer by radio: ''I'm in a birch forest. . . .'')

The benefits of *Maple Flag* vary according to the participants. For the Canadians, it gives them a chance to exercise with allied air forces, and to deal with realistic SAM and ''triple-A'' (antiaircraft artillery) threats. They expect their pilots will take part in *Maple Flag* at least once in each tour. For the others, *Maple Flag* simulates European geographic and climatic conditions far more than Nevada – although weather conditions are usually much clearer than on the Continent. (The Cold Lake base can be seen from the air at a range of 50 miles, according to the aircrew.)

But one of the biggest spin-offs for everyone is the chance for the airmen to learn from each other's tactics, strengths and weaknesses – and to develop their own ideas accordingly. The large ramps at CFB Cold Lake enable them to continue the liaison at ground level, with many of the aircraft parked in the same area, and social contacts and sports are encouraged.

(And those moose which inhabit the range? The Buccaneer crew which spotted two of them just had time to notice that the big animals ignored their sudden low-level appearance. Curious, they asked a Canadian pilot in the Mess why this should be. He explained: ''I'm not surprised. They're all probably used to us by now!'') – Courtesy July 1979 *Air Clues.* ■

4 BLUE NEWSLETTER

it's always THE OTHER GUY

■ Safety campaigns ought to be effective. Our basic motivation for survival and self-interest should be powerful forces in promoting safety. But safety propaganda will never be 100 per cent effective in achieving improvements because we all believe accidents happen to someone else, not to ourselves. The person reading the safety poster has probably not suffered the type of accident described, and probably believes himself to be too skilled to make such an error.

Don't give up yet— where the effort has been made to overcome dangerous conditions, the pattern of accidents has changed. Understanding of human factors has progressed sufficiently to be of real value in the design of our working environment. If adequate priority and emphasis is placed on reducing human error, there is no doubt that the goal can be achieved.

Commanders, flight leaders, and IPs all play an important role in developing a new pilot's flying ability and his respect for the aircraft performance envelope. It all begins with leadership and in a word— attitude. If our attitude is mission and safety oriented, others will see it and imitate it. If our attitude and resulting actions reflect self-discipline, concern for education, knowledge and respect for limitations, the less experienced pilots who follow us will think and act the same way. Attitude is contagious.

Commanders, flight leaders and IPs all play an important role in developing a new pilot's flying ability and his respect for the aircraft performance envelope.

We have come a long way since World War I. When aviation was in its infancy the Royal Flying Corps lost 2% at the hands of the enemy, 8% because of mechanical or structural failures of their aircraft and 90% as a direct result of their own individual deficiencies. The primary role in the modern man/machine system is a processor of information as opposed to the once essential role as a source of mechanical power.

We do not have a clear understanding of the factors which cause even well-trained, professional pilots to become involved in errors at critical point in flight. Neither do we understar the factors which may be responsible for their failure, to recognize and react to presumabl clear warnings.

Let's have a look at a typical month. We will see that it doesn always happen to the other guy. have mishaps from T-37s, to RC-135s and A-10s to F-16s.

■ An F-4 was lead of a two-sh flight engaged in scheduled DAC (Dissimilar Air Combat Tactics) with two F-15s. After the third engagement, the F-4 started a cli and the stick went full left. The crew ejected successfully when th were unable to control the aircraf

■ A C-135 pilot initiated a rol takeoff on a wet runway. During power application, directional control was lost and an abort attempted. During the abort, the pilot failed to retard number four throttle and the aircraft made an accelerated left turn departing the side of the runway.

■ A fighter returning from a training mission flamed out due t fuel starvation. The pilot failed t reposition the air refueling switch after refueling. As the pilot experienced what he thought was

sluggish control response, he made the decision to eject. In effect, reduced airspeed and an increased angle of attack produced the perceived sluggish flight control response.

■ An F-4E ended up in a nose-low spiral during the first engagement of a three-ship ACT (Air Combat Tactics) mission. During the recovery, the pilot heard wo bangs as the throttles were advanced. The pilot ejected when he aircraft failed to respond to aft stick.

■ An A-10 rolled to about 80 degrees bank with the nose 10 to 15 degrees low following a dry air-to-ground missile attack. The chase pilot called for the pilot to roll out; owever, the aircraft impacted the ground with no apparent attempt to ecover or eject.

■ A trainer landed short of the verrun, caught fire and was estroyed following a straight-in no-lap approach. The IP allowed the tudent to fly a steeper than normal lide path which resulted in a high ate of descent at low altitude with ower at idle.

■ Two F-4s were a free fighter and engaged fighter on a three-ship 2 vs 1 ACT mission. When the engaged fighter became stagnated, the free fighter began repositioning in the vertical and hit the engaged fighter. The free fighter misidentified the target aircraft as being the engaged fighter, then failed to make a "loss tally" call and proceeded into the fight regardless.

■ An F-4 touched down short of the runway threshold following a night single ship landing from a GCA. The right gear collapsed, and the aircraft departed the runway.

■ And finally, a T-38 on a student cross-country; the pilots ejected after interpreting a Stability Augmentor System malfunction as an aileron disconnect problem. This fixation followed from the crew's detailed knowledge of a previous T-38 fatal mishap involving aileron disconnect. The impression of flight control problems was enhanced by the increased stick forces— both pilots were on the controls due to a misunderstanding in transfer of aircraft control.

The lessons learned from this mishap, so very well expressed by the board, have significance for us all. The importance of thorough troubleshooting of aircraft emergencies when time and conditions permit. The board also notes caution should be exercised in digesting these lessons learned in their proper context. *The board believes delayed ejection during out-of-control conditions is a significant hazard to aircrew which must remain a pre-eminent consideration.*

Unfortunately, the best laid plans of mice, men and women sometimes go asunder. Most of us can't get the job done flying the thing like an airliner— they design fighters to perform, and we operate our aircraft fairly close to the limits. Close enough, in fact, that we occasionally find ourselves experiencing the first stages of control problems and have to back off to keep it in rein. We can say "stay within the envelope" all day long and we can preach fly safe 'til we are blue in the face, but until we realize the next accident they see in the papers may be ours, . . . we always believe it will happen to the other guy. ■

until we realize the next accident they see in the papers may be ours, . . . we
ways believe it will happen to the other guy.

Wing Surface Roughness cause & effect

By **RALPH E. BRUMBY,** Principal Engineer, Aerodynamics

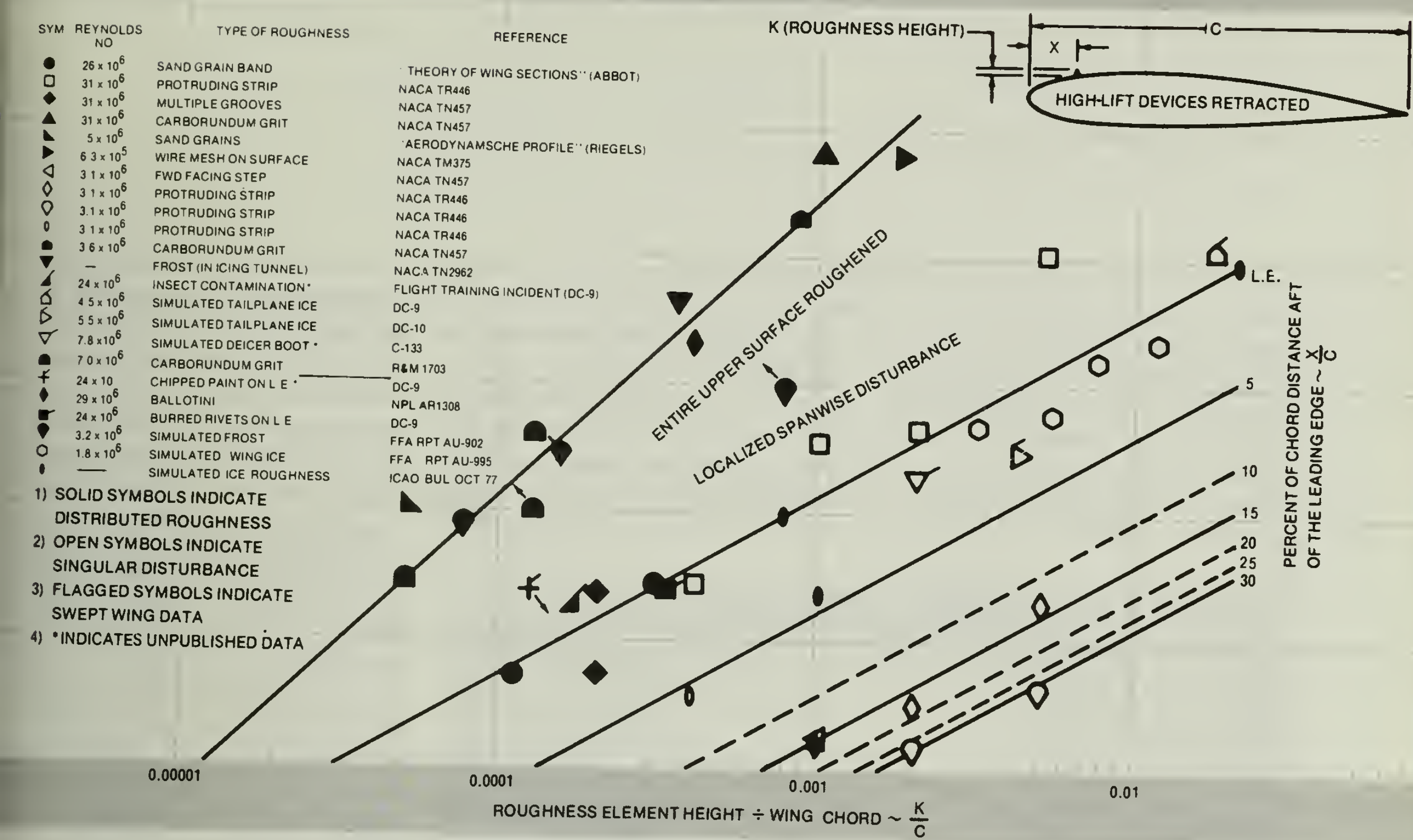
Wing section in icing tunnel — The amount of ice on the upper wing section generally means bad news, but the much lesser amount on th lower portion can also cause problems.

■ Most flight crew members are aware of the highly adverse aerodynamic effects of large amounts of wing surface roughness, such as the irregular shapes that can form on the leading edge during an icing encounter. However, what is not so popularly known is that seemingly insignificant amounts of wing surface roughness can also degrade flight characteristics . . . roughness caused by frost, snow or freezing fog adhering to the wing surface, large accumulations of insect debris, badly chipped paint, or a distribution of "burred" rivets over the wing surface.

In some countries, regulations d not permit takeoff when frost, snow or ice is adhering to the aircraf Elsewhere, however, dispatch is pe mitted if, in the judgment of the flig crew, the accumulation will not affe the safety of flight. Thus, a flig

Figure 1

REDUCTION OF MAXIMUM LIFT COEFFICIENT DUE TO WING SURFACE ROUGHNESS
HIGH-LIFT DEVICES RETRACTED



rew may be called upon to decide if particular amount of roughness and s location are sufficient to significantly degrade the aircraft's flight haracteristics.

The intent of this article is to assist 1 that decision-making by providing n insight into the effects of small mounts of wing surface roughness n aircraft flight performance.

For full wing span upper surface oughness beginning at the leading dge and extending varying distances ft, the typical effects are a reduction f the maximum lift coefficient (inrease in stall speed), a reduction in e angle of attack at which stall ccurs, and a rapid post-stall drag crease. The effects become more dverse as the size and chordwise tent of the roughness increase. They ay also be accompanied by a reuction in lift at a given angle of atck and by an increase in the wing rasite drag.

Figure 1 is a correlation of wind tunnel and flight data showing the effects of surface roughness on the maximum lift coefficient of a wing with high-lift devices retracted. The effects of various forms of wing surface roughness differ when high-lift devices are used.

Typically, the deflection of trailing edge flaps tends to increase the effects shown. Full-span leading-edge high-lift devices tend to suppress the adverse effects of small levels of roughness, but have little influence over large levels of roughness.

Further complicating the overall situation is that premature stall due to surface roughness effects occurs at a lower than normal angle of attack. Therefore, it is possible that angle of attack-dependent stall warning system such as the alpha (a) vanes used on most current jet transports may not provide warning prior to actual stall.

As might be expected, the leading edge portion of the wing is most sensitive to surface roughness. The effects of surface roughness on the maximum lift coefficient decrease as the forward-most extent of the upper surface roughness moves farther and farther aft of the leading edge. Also once slightly aft of the leading edge, moderate amounts of roughness on the lower surface have little or no effect on stall speed.

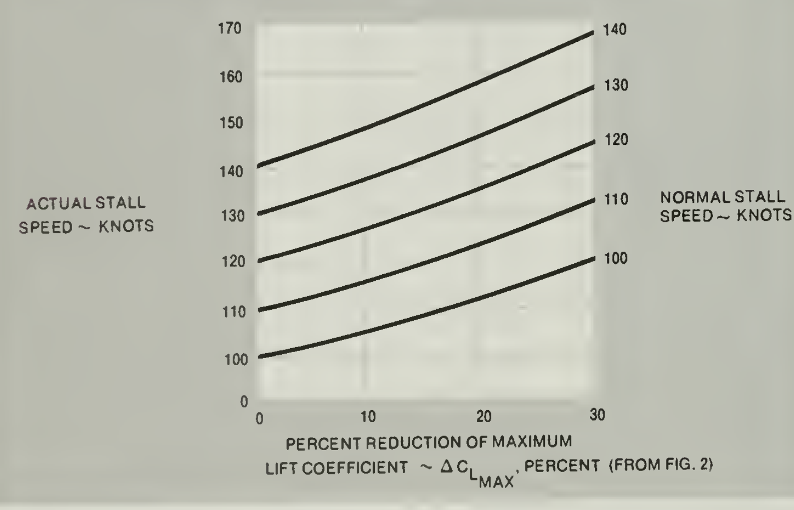
Most aircraft are designed for the stall to begin inboard in order to maintain lateral control as long as possible, and to achieve satisfactory pitching characteristics throughout the stall. Therefore, roughness extending less than full span may have a lessened effect depending on its location with respect to where the smooth wing stall initiates. Unsymmetrical roughness accumulation may result in premature stall of one wing, with re-

Wing Surface Roughness continued

sultant wing drop or rolloff.

What all this boils down to is that an aircraft affected by wing surface roughness will stall prematurely, possibly before reaching the angle of attack for stall warning actuation. Further, any reduction in lift at a given angle of attack will obviously

Figure 2 STALL SPEED INCREASE DUE TO A REDUCTION OF MAXIMUM LIFT COEFFICIENT



require a higher than normal airplane angle of attack to produce the desired amount of lift. This could, for example, require rotation to a higher than normal takeoff pitch attitude in order to achieve a normal liftoff and climb. Unfortunately, the higher angle of attack further reduces the already degraded margin to stall.

These effects are particularly important for early transport aircraft having no leading edge high-lift devices. Extension of the wing leading edge devices of more advanced aircraft will generally recover most of the stall speed degradation resulting from the low levels of roughness cited here.

The effects of small amounts of wing surface roughness may not be particularly noticeable to a flight crew operating within the normal flight envelope. Since all transport aircraft operating speeds have some margin above the actual smooth wing stall speeds, the roughness effects may have only decreased that margin. For example a 1.3 Vs approach speed may have had the margin reduced to 1.1 Vs, leaving little actual stall margin for maneuvering or gust tolerance.

In a recent accident, a flight crew decided that because they had experienced no problems during approach and landing through a mild icing encounter, they would dispatch without removing a small amount of ice that had accumulated on the leading edges During takeoff where the margin to stall is typically less than that for landing, the aircraft apparently stalled upon leaving ground effect and impacted at the end of the runway. This is not the only known incident. Frost appears to have been a contributing factor in at least two other recent takeoff accidents of transport aircraft.

Decisions to take off with some frost or snow on the wings may have been influenced by discussions of tests on military aircraft showing that frost appeared to cause no degradation in takeoff performance. But the tests were directed only at establishing if the particular aircraft would take off at the handbook speeds. No attempt was made to determine how much the stall margin had been reduced by the frost.

How rough is rough? Distributed roughness elements having a height of only 1/10,000 of the wing chord can adversely affect the maximum lift co-efficient significantly increasing the stall speeds as shown in Figure 2. This height corresponds to about 0.015 inch on a DC-9 type aircraft and to about 0.030 inch on a DC-8 or DC-10 type aircraft—about the roughness of medium to coarse sandpaper.

How does this compare with the roughness due to frost? Literature on frost indicates a seeming threshold where individual frost grains appear on a surface and are much like fine salt grains having effective diameters of about 0.004 inch. As frost progresses, the grains grow to about 0.01 to 0.015 inch in effective diameter. Further progression is usually of two forms: The layering of frost grains and the development of frost needles

The layering can develop into an ir-
regular surface of hills and valleys composed of numerous 0.010- to 0.015- inch grains – much like ripples in desert sand. In this case, the height of the irregularities will be more important than the individual grain sizes. The needles are usually closely spaced and have been observed up to 0.100 to 0.125 inch high. However, they are generally frail and have been known to break off to some lesser height at speeds of about 40 to 60 mph.

Observed on rare occasions is the development of "vertical frost-plates." Such plates can present extreme roughness as they are strong thin, vertical surfaces that have been observed from 0.125 inch to 0.250 inch high and 0.250 inch to 0.500 inch long at the base. They look much like closely grouped miniature vortex generators.

Crew members who have tried to brush off accumulations of frost (or snow) are also familiar with the rough surface that can form if the underlayers of an accumulation had melted slightly and then refrozen to the surface.

An operational problem occasionally encountered is the instance of an aircraft landing in a humid area after having been cold-soaked during high altitude cruise. During the ground time, the fuel in the tanks remains at below freezing temperature, causing frost to form on the underside of the wing in the region of the fuel tank. Keeping that area frost-free becomes an almost impossible task. As the frost is removed it re-forms and will continue to form until the fuel temperature and the ambient temperature spread is more in line. While moderate accumulation will not affect stall, the surface roughness will increase the wing parasite drag and can affect takeoff performance.

All forms of roughness tend to degrade the lifting capabilities of a wing; therefore, other sources of small distributed roughness should not be overlooked.

Observations have taught us that stall speeds in the cruise configuration can be increased significantly due to chipped paint, "burred" rivets (i.e., flush head rivets along the wing leading edge whose edges have curled up) and the buildup of impacted insects on the leading edges.

One known experience with insects relates to a training mission of a particular aircraft. At 15,000 feet in the clean configuration, the crew prepared for a series of stalls. The calculated stick-shaker speed was 136 knots with stall at 131. At 140 knots, and without any warning, the aircraft went into a stall with a rapid roll to the left. During the recovery, the stick shaker activated and the stall warning came on. After recovery, a second stall was attempted, with identical results. A third stall with flaps at 15 degrees and slats extended, and a fourth stall in the landing configuration, also with slats extended, were executed and the aircraft behaved normally.

After landing, an inspection of the aircraft revealed heavy insect accumulation on the nose section and along the wing's leading edge.

The following day, after a thorough washdown, the same aircraft was flown again through the same stall series, under the same conditions. This time the aircraft performed on the numbers according to the book.

It is interesting to note the stalls that resulted, not only from insect accumulation, but from the "burred" rivets and chipped pant, were also abrupt and without prior warning. Available data from several occurrences are included in the correlations of Figure 1.

In recapping the details of this article, the following appear to be the most pertinent:

- Accumulations equivalent to medium or coarse sandpaper covering the full span of the wing's leading edge can cause a significant increase in stall speeds, leading to the possibility of a stall prior to the activation of stall warning.
- Wing leading edge high-lift devices, even in the extended position, will provide little or no benefit in recovering degraded lift due to large amounts of roughness. They will, however, recover most of the degraded lift caused by small amounts of roughness.
- Unsymmetrical roughness can cause wing drop, or rolloff, at stall.
- Moderate roughness present aft of the leading edge, a distance of about 10 or 15 percent of the wing chord length, will have little or no effect on stall.
- Roughness occurring slightly aft of the leading edge on the wing's lower surface will have little effect on stall, but it does increase parasite drag which will affect takeoff performance. ■

– Adapted from DC Flight Approach, McDonnell Douglas Corp.

eject or die

CAPTAIN S. R. VAUGHAN
355 TFS
Myrtle Beach AFB, SC

■ Pretty strong words, huh? But all too often the decision to eject is either not made or is made too late. Why? Many times this decision is supposed to be made for you long before the emergency situations arise.

How many times have we read or been told: "Out of control below 10,000 ft AGL– EJECT?"

But why do accident reports still contain such statements as "The crew died on impact," or "Ejection was initiated out of the safe ejection envelope, and the pilot received fatal injuries."

A recent aircraft accident involving a fighter in an out-of-control situation resulted in the death of two crew members. Some facts surrounding the mishap are known, some will never be known.

The aircraft departed controlled flight at approximately 12,000 ft AGL. The instructor pilot in the front seat deployed the drag chute in an attempt to recover the aircraft. The instructor pilot in the rear seat initiated a dual-sequenced ejection at a low altitude. The back seater's chute deployed seconds before collapsing into the water. The front cockpit ejection seat did not have time to leave the aircraft.

Why was the decision to eject delayed? We'll never know.

In 1978, 30 active TAC and TAC-gained aircrew members were lost in 52 Class A accidents. Many of these men would be alive today if a timely decision to eject had been made.

Let's look at a few cases where crew members did survive.

A pilot lost an engine on his twin engine aircraft. With the flight lead flying chase, he returned to base and prepared for a single-engine straight-in approach. At seven miles on final he became preoccupied with caution lights, and when he looked back outside, he found himself in a 30 degree yaw and 135 degrees of bank, nose low and passing through 900 ft AGL.

He ejected safely after realizing that the ejection handles were on the sides of the seat instead of between his legs where he had first reached. Prior to ejection, the possibility had not occurred to him. This lack of preparation and subsequent loss of valuable time could have cost him his life.

Another pilot found himself nose low at low altitude and low airspeed. Each attempt to raise the nose and break the descent rate resulted in aircraft buffet and stall.

While still attempting to recover the aircraft he remembers thinking that: Colonel . . . (the wing CC) is sure gonna be mad. He successfully ejected *as the trees were hitting the bottom of the aircraft*.

Why was the pilot thinking of the wing CC during this critical emergency? He admits that this probably delayed his ejection for some extremely short period of time, but has no idea why he thought about the wing CC.

These accidents bring a few things to light. Mishaps where crew members survived point to several reasons for delayed ejections.

Channelized attention is a possible factor. Most out-of-control situations that we practice in the simulator begin at an altitude above 10,000 ft. The response that the instructor is looking for is the "Out-of-Control Recovery." The situation may continue until ejection is

equired, but always after recovery nas been attempted. If you're at or near 10,000 ft AGL when you start he recovery procedure, you'll probably be out of the safe ejection nvelope when you realize that jection is required.

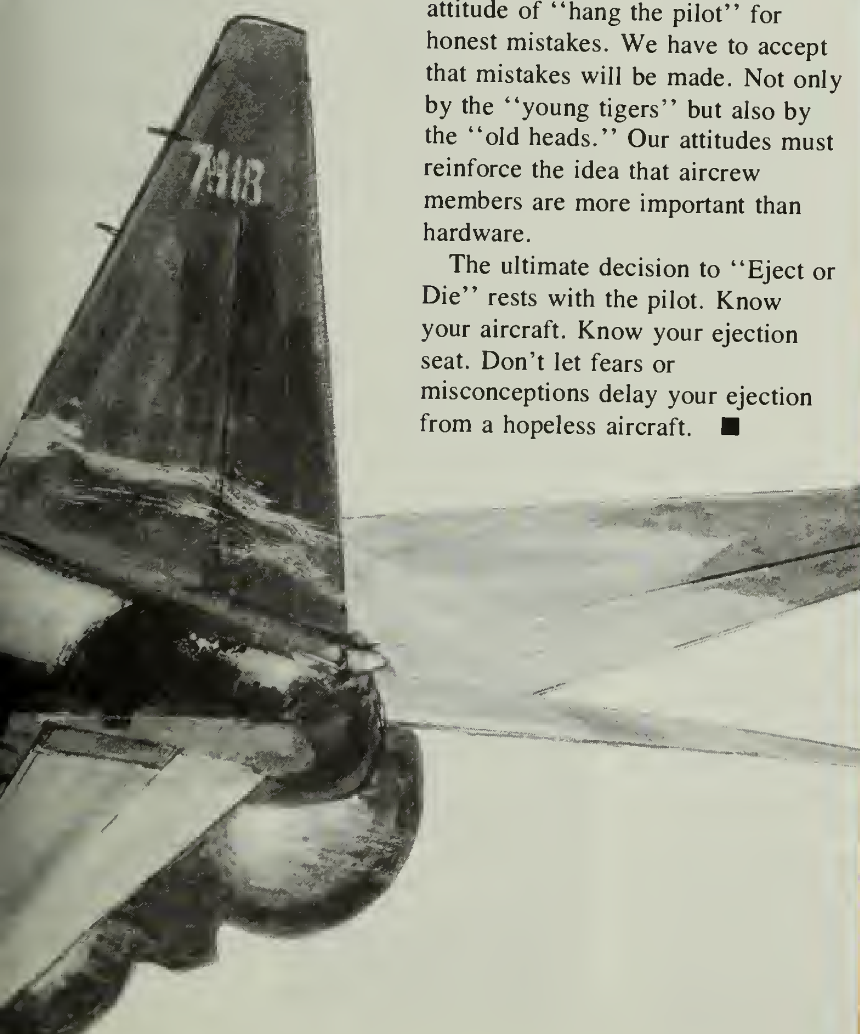
Lack of preparation is another ossible factor. We, as pilots, can nd must eliminate a large part of his risk. We have to fully nderstand the aircraft we are flying. Know what its capabilities are . . . what it can do . . . what it can't do . . . keep the machine in its envelope . . . but if things really get bad, we must be prepared to abandon the aircraft without hesitation or fear.

Know the seat you're flying in. Know its envelope. Give the bird an honest chance to fly, if time permits, but get out while you're still in the safe envelope of the seat. *Give it a chance to work for you.*

Fear of losing face or fear of reprisal may explain a person's lack of decision. We are all influenced by our superiors and our peers. We must all be aware of the influence that our attitudes and perceptions have on others. The system cannot tolerate willful violations, disregard of standard operating procedures, negligence, etc.

Neither can we tolerate the attitude of "hang the pilot" for honest mistakes. We have to accept that mistakes will be made. Not only by the "young tigers" but also by the "old heads." Our attitudes must reinforce the idea that aircrew members are more important than hardware.

The ultimate decision to "Eject or Die" rests with the pilot. Know your aircraft. Know your ejection seat. Don't let fears or misconceptions delay your ejection from a hopeless aircraft. ■

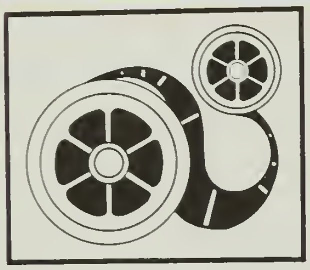


New Seminar On Lightning

■ Air Weather Service (AWS) developed a 15 minute 35mm slide and tape seminar for aircrews on the hazards of lightning strikes and electrostatic discharges. These are the leading causes of reportable weather-related USAF aircraft mishaps. The seminar includes discussions on thunderstorm lightning, aircraft triggered lightning, electrostatic discharge, the effects of lightning on aircraft and aircrews, meteorological conditions where lightning strikes occur, what to do to avoid or reduce the probability of a lightning strike, and some of the things to do if struck by lightning.

The Air Force Inspection and Safety Center recommends all aircrews see this seminar as soon as possible. Each weather detachment has a copy available for loan. Additionally, AF flying units can obtain a copy from AAVS through their Base Film Library. The seminar is titled "Lightning Strikes to Aircraft" and the AAVS number is STT-Q9-0113.—Capt Lehneis, AWS/DNTS, AUTOVON 638-4741. ■

OPS topics



Low Level Training Film TS 1414, "Visual Illusions"

■ "Visual Illusions," (TS 1414), a new low level training film, is now available in video tape form. The show deals with distortions in perception caused by terrain features which can be encountered during low level flying. The 16mm version of this film should be available by 30 November 1979. Contact your local audiovisual shop to obtain the show and order by number: video tape – VC3 TS 1414; 16mm film – TS 1414. – Maj Gary L.Sholders, Directorate of Aerospace Safety.

Misaligned Landings

Remember one of the first things you were told as a student pilot was "If it doesn't look right, take it around." Here's why.

■ After going heads up at 220 ft AGL, the pilot of a C-141 attempted to line up with the runway by banking right. At that point GCA called "minimums, slightly right of course, runway is on your left." The pilot then banked left and, as he crossed the threshold, saw the aircraft was drifting left of centerline and corrected again to the right. Touchdown was soft and everything appeared to be okay. Post flight revealed the right wingtip had dragged on the runway.

■ A student pilot flying a KC-135 attempted a last minute correction to line up and started his flare a little high. The IP tried to salvage the landing but the nr 4 engine cowling scraped. The ensuing fire damaged six feet of cowling and several components.

■ Fighters may be more nimble, but . . . An F-4E pilot with radio problems saw the runway at GCA minimums 200 ft to the right. His wingman called for a go around, but the message was not received. The mishap pilot continued the landing by turning right but decided to go around just prior to touchdown. However, the aircraft touched down in a right drift slightly right of the centerline, on a wet runway. Wind was from the left. The aircraft right main tire left the runway, but the pilot flew the aircraft out with no damage.

There But For . . . Go I

The photo on the back cover was taken the day after two highly qualified pilots were on a proficiency flight in a high performance fighter. After about 30 minutes of flying time, while the front seater was sweating out an instrument approach at a nearby air patch (under VMC), the back seater decided it was time for a smoke. He unfastened his oxygen mask, folded his glove and placed it in the mask to cut down the noise for the front seate lit up a fag and POW!! flash fire that lasted abo 3 seconds ruined his who beautiful day. How mar of us have done the san thing and lucked out?

The final results of o second of forgetfulnes second degree burns on h right hand and wrist, severe reprimand from t boss, two to three weeks no flying, a chagrined pil and a lot of grief from t rest of the troops.

Did You Know?

The temperature rise aircraft tires on takeoff r is less than a third of t tire temperature rise resu ing from taxiing appro mately 3 statute miles? I proper taxi techniques c contribute to an insidic buildup of heat due to netic energy absorpti during taxiing. This h can deteriorate the sic wall structure of the ti producing a blowout – p haps during a critical pha of takeoff.

Overheated brakes c kill. . . .

Overheated tires will you down, suddenly! Courtesy RAF *Flight Saf Digest*, Spring 79.

/inter Stuff

With winter coming on, e can expect a few prob- ems associated with the old season. Since fore- arned is forearmed, e're recounting a few vents from last winter as reminder.

An 0-2 operating at a unicipal airport landed the overrun because the verrun border lights and reshold lights were ob- ructed by snow to final proach slant range visi- lity. The 19-inch snow epth collapsed the nose ear. Subsequently, the ont prop was bent and the ont engine torn from its ount. Both pilots were ocked to discover that they had landed on the overrun, not the runway. It happens nearly every year — be alert.

An aero club Cessna 172 was extensively damaged during landing when the aircraft struck a snowbank. At touchdown for a full stop landing, the aircraft veered right. Power and left rudder were applied but the engine coughed and stalled. Carburetor heat was full on. The aircraft then plowed into the snow beside the runway and nosed over. Investigators believe a brake was locked by ice and that sudden application of power with an excessively rich mixture caused the engine to stall. The rich mixture is common at cold temperatures — in this case 0°F. Brake lock was thought to have been caused by brake heat from taxiing, melting snow, and the moisture freezing on the brake pucks after takeoff.

During the past year, there have been several instances when aircraft and other vehicles have shared the runway at the same time. That, of course, is not good. Here's an example: KC-135 landing, pilot sees dark objects at departure end of runway. He decides to accelerate for takeoff and leaps off at the 6,000 ft point when the dark objects are defined as a truck and snow plows. This incident resulted from poor visibility caused by patches of ground fog on the runway and controller complacency. Although the red light denoting vehicle on the runway was on in the tower, no one noticed it, and the controllers could not see the snow plows because of the fog.

Herc Hits CAT

Puma? Lynx? Well, no, it all started with a good weather forecast. Our intrepid Herc captain set off on a trip up the east coast of Canada. After ascending to avoid some prowling CBs, he hit the CAT. To quote: "Large variations in aircraft altitude and rapidly changing G forces started to occur. The AC pitched between 15° nose up and 20° nose down with up to 50° of bank. The turbulence reached a stage such that the copilot found it difficult to operate the transmit switch to put out a *mayday*. The captain was faced with marginal control and the feeling that the ship was about to 'stress relieve' by falling apart."

Luckily, they descended out of the CAT before the AC was structurally damaged. Nearly a fatal accident because of a lack of information on the weather. If you are warned about CAT, steer clear (? no pun intended), you could get very shaken up . . . structural failure at FL290 leaves you a long way up, and a quick way down. And if you are really clever, you can predict CAT areas by looking at the weather charts — no I'm not going to tell you, ask the Met Man! — Courtesy RAF *Flight Safety Digest*, Spring 79. ■

A LOOK AT Brake Cooling

By **WALT BLAKE** • The Boeing Company

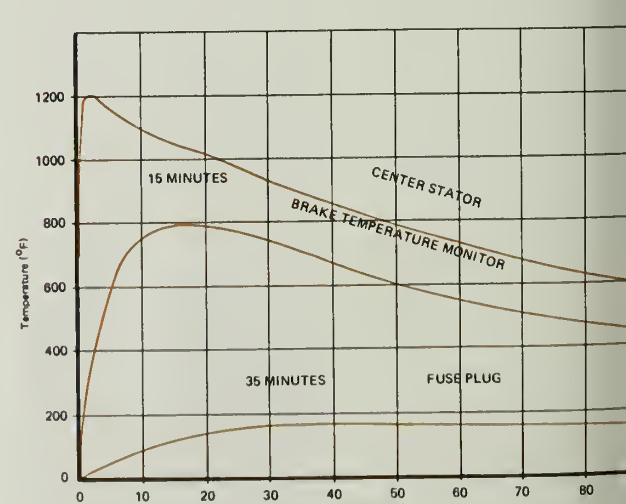
■ Consider the following scenario: An aircraft makes a normal landing following a routine flight. After taxiing two miles to the ramp, it is parked for an hour and a half, in preparation for the next leg. The airplane is then taxied several more miles to the active runway and the takeoff roll is begun. At approximately 110 knots, the pilot rejects the takeoff (RTO) and the airplane is taxied off the runway. After checking the problem that caused the RTO and deciding to continue the flight, the crew determines from the brake cooling chart that the brake energy from the RTO is below the "caution" range. They therefore taxi back and proceed to take off. Several tires fail during the takeoff and the thrown pieces of tread cause considerable damage to the airplane; more damage is incurred during the subsequent landing. The airplane is grounded two weeks for repairs.

Fiction? Not at all . . . although it was an unusual combination of circumstances, it did happen, and there have been a number of similar incidents. Most of them were avoidable.

The Cause

The underlying cause of these incidents is a lack o awareness of the essential facts concerning airplan brakes:

- The kinetic energy which is absorbed in stopping th airplane is converted through friction into heat energ
- The brakes dissipate this heat very slowly. Depend ing on many variables, an hour of ground cooling wi



reduce the temperature by only one-half or less.

- Heat energy is cumulative. A typical flight and taxi sequence can progressively increase the brake temperature to a significant level.
- Even a moderate kinetic energy absorption by a brake which is already hot can cause the wheels to reach a temperature high enough to melt the protective fuse plugs. This will result in tire deflation.
- Depending on the energy absorbed, tire deflation can occur at a time ranging from only a few minutes to almost one hour after the energy has been absorbed.
- Failure of a tire is, for all practical purposes, the same as failure of a brake; tire failure during an RTO or a landing will thus increase the distance required to stop the airplane. It will also increase the amount of energy which the remaining operational brakes must absorb and therefore will increase the possibility of melted fuse plugs in those wheels.

In the above incident, the brakes were still hot, but ithin limits, at the time of the RTO. The RTO energy sorption was enough to raise the brake/wheel temperures to a point which resulted in tire deflation. The deation, which probably occurred during the taxi back to e takeoff point, was not detected. The takeoff on the at tires caused their failure and the ensuing airplane mage.

ie Prevention

- Use good pilot technique during landings and taxiing to minimize kinetic energy inputs to the brakes. Prompt extension of the speed brakes, proper use of reverse thrust, and judicious application of the brakes are important. Careful control of the touchdown speed and touchdown point are essential.
- Any landing at a weight exceeding the certified maximum "quick turnaround" weight, or any rejected takeoff, is cause to stay on the ground long enough to ensure that the tires will not deflate.
- Use of in-flight gear-down brake cooling can reduce residual heat energy very rapidly and is recommended particularly for short-haul operators to whom cumulative heat energy can be a serious problem. It is also valuable on training flights making full stop or stop-and-go landings. The gear-down cooling can be accomplished either by delayed gear retraction after takeoff, performance permitting, or by early extension on approach.

Sources of Kinetic Energy

There are two airplane maneuvers which may require the brakes to absorb large quantities of kinetic energy: Landings and rejected takeoffs.

Rejected takeoffs from high weights and speeds, which fortunately are rare, represent the most extreme use of the brakes, since an RTO is typically at a higher weight than a landing, and available stopping distances may be significantly shorter than during a landing. The RTO speeds may be as high as, and in some cases higher than, the landing speeds. A maximum-energy RTO will require replacement of the wheels, tires, and brakes.

Even at the same weight and brakes-on speed, an RTO requires the brakes to absorb more energy than a landing because:

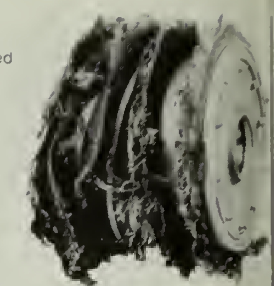
- The airplane during an RTO has less aerodynamic drag, due to the smaller flap setting.
- An RTO is initiated while the engines are producing takeoff thrust, compared to a landing in which the brakes are applied with the engines already at idle thrust.

A significant source of energy which must be absorbed by the brakes, largely overlooked but nevertheless very important, is taxiing. Depending on engine thrust and airplane weight, it is often necessary to use the brakes simply to keep the airplane from accelerating to an unacceptable taxi speed. In addition, taxiing requires full stops at times.

Energy Accumulation

It is essential to understand that heat energies are cumulative. Examine a conceivable flight sequence beginning with the landing: The landing by itself requires a moderate amount of kinetic energy to be absorbed by the brakes. When the landing is followed by taxiing, more heat energy is added to the already heated brakes. Parking the airplane for normal turnaround times does not fully cool the

A Look At BRAKE COOLING continued



brakes since the heat is dissipated quite slowly. Taxiing out for the subsequent takeoff adds still more heat energy. In the event of even a moderate RTO, then, the brake/wheel temperatures may be raised above the point at which the fuse plugs will melt.

Let's look at an example of brake energy accumulation in a representative airline operation. A 737 leaves Seattle for its first flight of the day to Portland, San Francisco and Los Angeles. The brakes are cool before the landing at Portland, but the 95,000-pound landing, plus the taxi-in, requires the absorption of approximately nine million foot-pounds of energy per brake. About three million of these will be dissipated during the half-hour ground time, but the taxi out will add a million.

As the airplane leaves Portland, then, each brake contains seven million foot-pounds of residual energy, only about two million of which will be dissipated during the one-hour flight to San Francisco. Landing there at 90,000 pounds plus taxiing, leaves each brake with about eight million foot-pounds at the time of takeoff. Obviously then, an RTO of moderate to high energy will put the brakes well over the fuse plug melt energy of 20 million foot-pounds. Even without an RTO, the short flight to Los Angeles means that the landing there will be made with some seven million foot-pounds remaining in each brake.

Temperature Time History

We have been talking about the slow dissipation of heat energy. To illustrate this, let's look at a chart of temperature versus time for a hot brake. Figure 1 shows the time-temperature history of a 747 brake following a 30-million foot-pound energy input – a moderate RTO.

Notice that the center stator, the hottest portion of the brake, almost immediately reaches its peak temperature of 1300°F and then begins the long slow process of dissipating its heat. Even after 90 minutes, the center stator is in excess of 650°F, ABOUT ONE HALF OF THE INITIAL HEAT ENERGY IS STILL IN THE BRAKE.

Notice also that the fuse plug does not reach its peak temperature until 35 minutes after brake application. This lag is due to the relatively slow flow of heat from the brakes outward into the wheels. The time lag between the brake and fuse plug temperatures depends on the energy absorbed – in the extreme high-energy case, the fuse plugs will melt within a few minutes.

A brake temperature sensor is installed on most 747's. The sensing element is located in the backing plate at the extreme end of the brake stack which is the only member of the brake heat sink which is static and therefore available for installation of a probe. This location, at the end of the brake stack, is not the hottest part of the brake immediately after a stop. The backing plate temperature continues to rise, and the center stator temperature drops, until the entire heat sink is at the same temperature. As a result, there is an appreciable time lag to the temperature indication, again due to the relatively slow flow of heat from the brakes outward. The lag will be as much as 15 minutes.

Brake Cooling Methods

In-flight cooling with the landing gear extended is by far the most efficient method of brake cooling and is especially useful for those training flights used to practice takeoffs and landings. Some airlines utilize gear-down inflight cooling after takeoff following a short turnaround, especially when the upcoming flight segment is brief, in order to ensure landing with reasonably cool brakes. When feasible, it is also effective to extend the landing gear somewhat early during the landing approach following a short segment.

Brake cooling when the airplane is parked is only fractionally as effective as in-flight gear-down cooling. Several hours may be required to cool the brakes to ambient temperature after a typical landing. Some airlines have adopted the practice of using large electric fans with airflow directed over the wheels and brakes to speed brake cooling when parked. The 747 has an optional brake cooling fan mounted within the wheel which has proven to be very effective.

Slowest of all is brake cooling with the landing gear retracted in flight, which is less than one-third as effective as on-ground parked cooling. To improve gear-up cooling, some airplanes have airscoops which direct cooling air through the wheel well in flight. – Adapted from a longer article in the *Boeing Airliner*, July 1979. ■

THE PROFESSIONAL APPROACH

AIR FORCE COMMUNICATIONS SERVICE
Scott AFB, IL

■ Q. How can I get an instrument approach procedure published?

A. This question has been asked many times by Air Force pilots who go into civil fields where approaches are being conducted and there are no similar procedures in the DOD FLIP. It is also asked by wing commanders and DOs who need a new approach to their airfield.

The answer is in AFR 60-27, "Flying Instrument Procedures." This regulation explains how IAPs are established, approved, reviewed and revised. It applies to all Air Force flying activities including ANG and AFRES units.

The first step is to formally make your request known for a procedure (departure, STARS, or instrument approach). Your request is made through the responsible Air Force Communications Service (AFCS) unit. Operations personnel assist AFCS personnel in developing, revising, monitoring and deleting procedures.

The second step is where the AFCS unit develops the procedure according to the needs of the host base or prime user, or requests the FAA to develop a procedure. To do this the AFCS unit needs civil engineering support for the data required to develop a procedure. This data includes surveys of airfield, obstruction data, field lighting capability and current engineering tabs from the base comprehensive plan. If the surveys are not available it may take 6 months to 1 year to get a complete, accurate survey for a base. The procedure is then drawn on the maps and charts and all obstacles are plotted and basic minima are determined by using the proper mathematical calculations. Because of the obstacles, this step may have to be repeated several times before the desired landing minima are finally achieved. A request for a waiver to terminal instrument procedures (TERPs) criteria may be required if the criteria are violated to get down to the approach minima that are desired.

The next step is local coordination at base level. This usually takes place with the wing commander or DO, stand eval, and line pilots all taking a look at the new procedure. If this will be a completely new procedure, then an environmental assessment may have to be completed. Once again, this consumes time.

Then comes the flyability check using the proper type aircraft to determine if the procedure is safe and flyable. The complete procedure is checked from a pilot's point of view. This check includes flyability and cockpit workload. This may require a few more adjustments or a complete overhaul of the proposed procedure.

The procedure package is now becoming pretty thick with maps, charts, letters and forms all put together to justify this procedure and its minima. The next step is for the AFCS unit to forward the package to the proper FAA/ Host Nation air traffic control personnel for their coordination and approval. A formal flight inspection by AFCS or FAA fight inspection personnel is requested. This inspection certifies that the navigational aid being used is capable of supporting the procedure. The signed package is returned to the AFCS unit who in turn forwards it to their headquarters for approval. Then the package is sent to HQ AFCS or to Defense Mapping Agency Aerospace Center (DMAAC) as required.

If a waiver is needed, more coordination is required and approval is needed from the Air Staff. The entire sequence of events is outlined in AFR 60-27. What you, the original requester, need to keep in mind is the amount of time it takes to develop, review, and publish a procedure. Many people have to do a lot of research and that takes time. The additional coordination for waivers sometimes makes one wonder if the approach procedure was worth the wait.

The approach will now be published and then revised or changed as new obstacles are built and old obstacles are removed. This means that the approach must be continually monitored for accuracy. In addition, each year the host base along with the AFCS unit reviews, revalidates, and advises HQ AFCS of the requirements for all terminal instrument procedures at that base.

To revise or change an approach may mean the same steps will be taken all over again. If a frequency, facility identification or other minor changes are made, then the change can be made as advertised in

continued on page 28

PRO APPROACH continued

FLIP. Any procedural change should be supported by at least an abbreviated package with the supporting documents. This package and documents should be processed through the local AFCS unit, up the chain as depicted in AFR 60-27. To delete a procedure you must go through the same steps again. This will ensure that a procedure is not deleted while it is still required by other services or agencies. Thus, as you see, the development and maintenance of an approach procedure is a complicated and tedious one, yet needed to ensure that the procedures are safe and flyable for the user.

Host nation (foreign) procedures will be processed in a slightly different manner. In either case, host nation or US, the local AFCS unit should be the focal point for all procedures and should be able to answer any questions you have on your procedures and probably give an insight to procedural questions at other locations. If you have a question they are the experts you should check with first. ■

How long can you hold your breath?

CAPTAIN ROBERT L. SEELEY
HQ ATC/IGFF
Randolph AFB, TX

■ Recently, two separate but similar physiological mishaps occurred. One involved an F-5 pilot (lots of experience), the other a T-38 student pilot (not so much experience).

Both pilots became hypoxic when they became disconnected from their oxygen hoses at the CRU-60 P connection. Additionally, both pilots were slow to recognize and correct their malfunctions, for various reasons. The oxygen hose retention strap turned out to be a contributing factor. An improperly adjusted retention strap can reduce the effective hose length from the seat to the pilot's CRU-60 P connector. As a result, during normal body movement the oxygen hose can become disconnected and cause problems. It can also be difficult to reconnect and readjust the oxygen hose and strap in flight.

The solution is to get everything adjusted *before* you take off. (Step nr 5 in the Cockpit (All Flights) Checklist.) The strap is designed to facilitate a clean man/seat separation so it's important to have it properly adjusted. Check the strap when you make your initial cockpit check before the walk around. Make sure you've got enough hose available. The strap *should not* slide too easily. (If it does, it could change adjustment during flight.) If the strap does move too easily, you can use one of the intercom/oxygen hose rubber positioning straps to help locate the hose retention strap and keep it from moving.

Besides proper adjustment of the hose retention strap, there is another circumstance which can cause problems – namely, oxygen hose length. Evidently, over the years various oxygen hose lengths have been used in the T-38. These included 36-inch, 14-inch, and the current 30-inch version. Several years ago they began changing out the then current 24-inch hoses with 30-inch ones on an attrition basis. As a result, there are still some 24-inch hoses in service. A 24-inch hose will most likely be too restrictive for most crew members. So if you find a hose that you think may be too short, write it up and get it checked/replaced.

It's important that you understand how to adjust all your personal equipment and connections to maximize their benefits. Talk to your life support and egress people if you have any questions. Preventing problems on the ground is a lot easier than solving them in the air. ■

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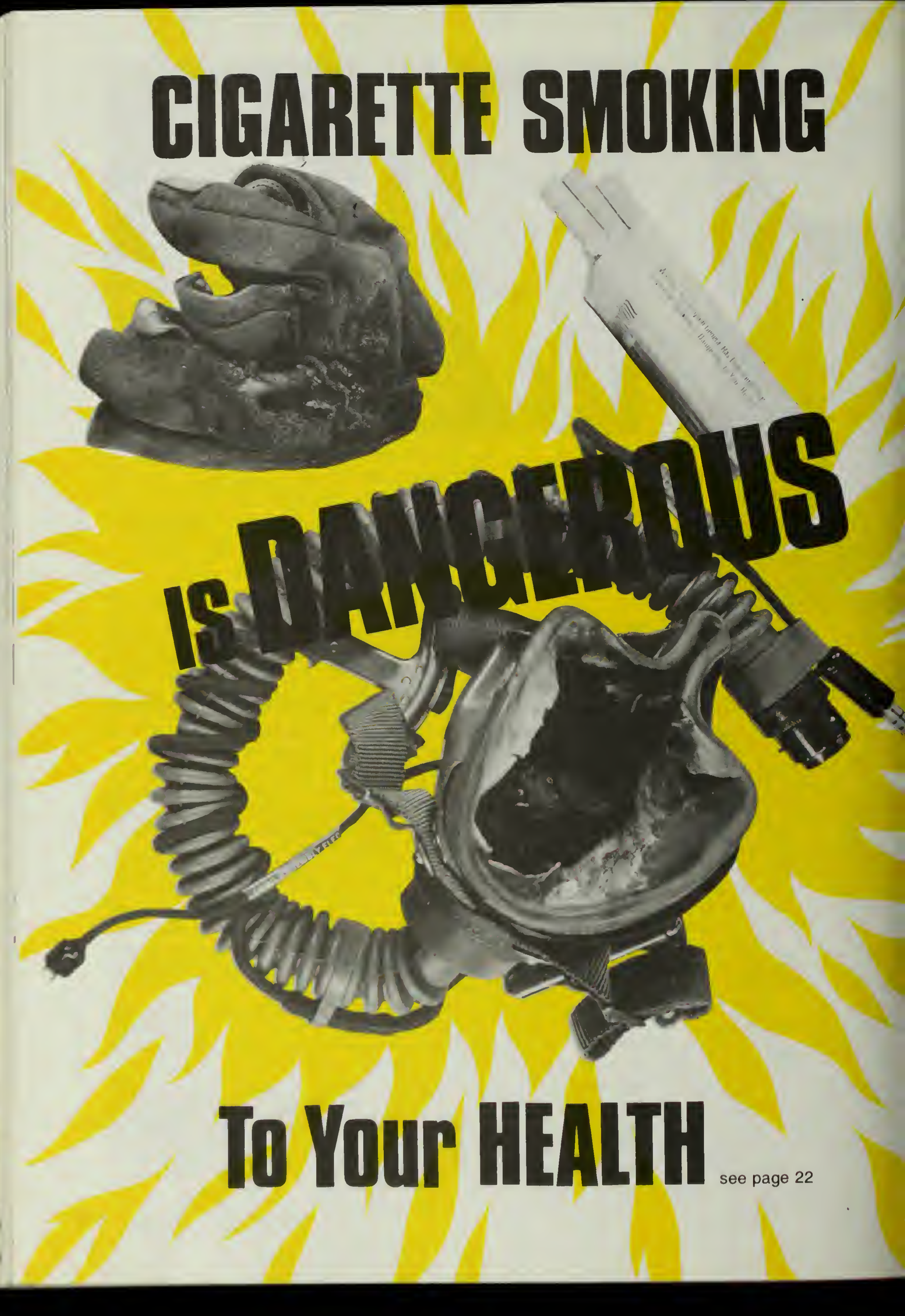
Patrick C. Welch

50th Tactical Fighter Wing

■ On 2 September 1978, Lieutenant Roberts and Captain Welch were on a cross-country flight in an F-4E. Both were inexperienced, having under 300 hours in the F-4. Halfway through their mission, over the middle of France at FL 330, severe engine vibration and loss of thrust occurred on the number one engine. As the oil pressure dropped rapidly to zero and vibrations increased, the engine was shut down and an emergency declared. The F-4E was heavily loaded with a centerline and two external fuel tanks and a travel pod. The partially seized engine made high altitude flight inpossible, and a rapid descent ensued. Level flight was achieved at 5,000 feet above sea level. At this point, the nearest USAFE base was 160 nm away, on the other side of the 11,000 foot Pyrenees mountains. Immediate calculations were made based on airspeed, fuel and drag indices. The only runway of sufficient length within range was a civilian field 70 nm away in the south of France. An initial heading vector was taken off the inertial navigation system which was known to be off by five miles. The weather at the civilian field was two miles visibility with haze and a broken 1,500 foot ceiling which made map reading difficult. The aircrew used dead reckoning to find the approximate position of the airfield. The problem of descending through the clouds, approach, and landing was complicated by no TACAN, GCA, VASI's or voice contact with the field controlling agency. A letdown was flown using the radar altimeter, INS updated steering, and an airborne radar approach backup into the haze below the clouds. In the haze, fighting disorientation and a now critical fuel state, a systematic search pattern was flown to find the airfield. After finding and visually clearing the runway, the crew made a perfectly executed single engine approach and landing. Lieutenant Roberts and Captain Welch demonstrated exceptional composure and professional skill in handling an emergency that could have resulted in the loss of the aircraft. WELL DONE! ■



see page 22

AEROSPACE

SAFETY • MAGAZINE FOR AIRCREWS

DECEMBER 1979

We

in the Directorate of Aerospace Safety

wish you a glorious Christmas and a safe and successful New Year

Garry A. Willard Jr.

GARRY A. WILLARD, JR.
Brig Gen, USAF
Director of Aerospace Safety

NITED STATES AIR FORCE

AEROSPACE

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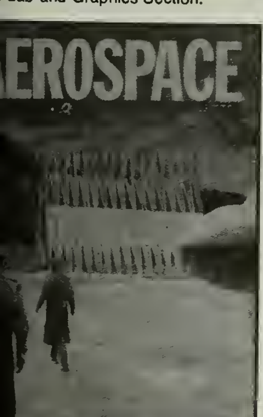

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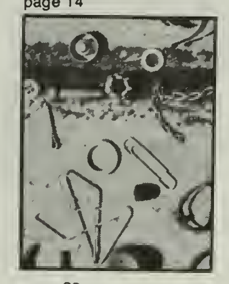

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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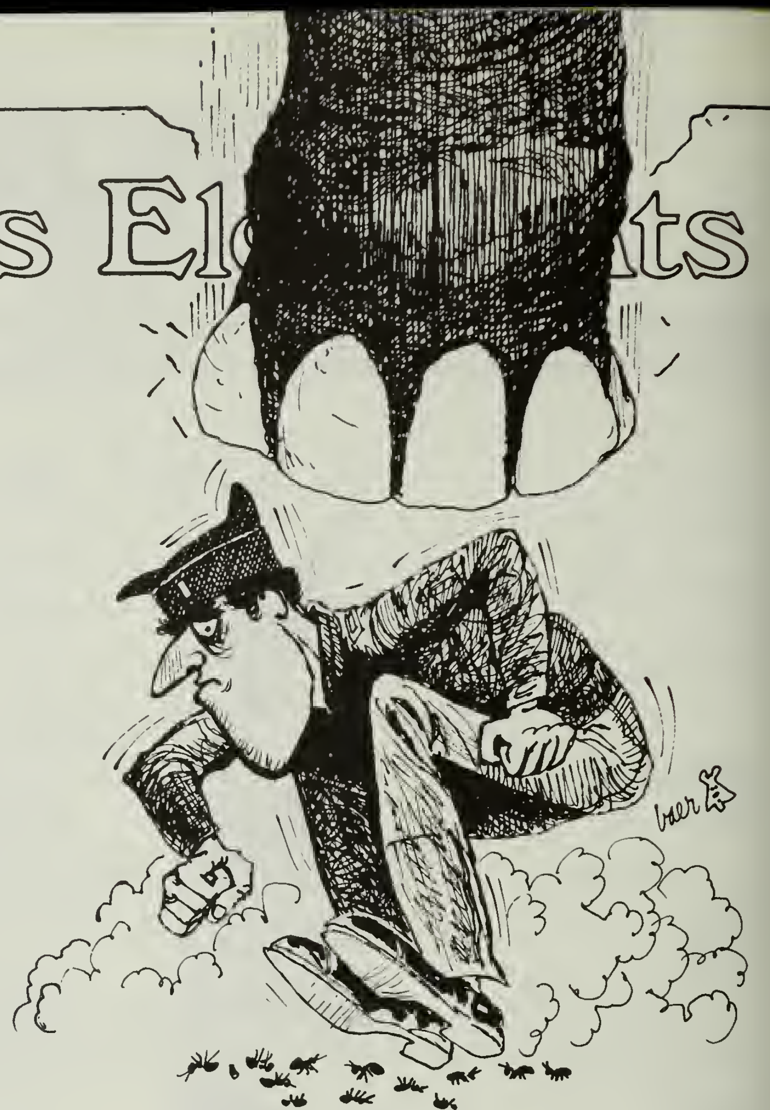
Ants vs Elephants

MAJOR GARY L. SHOLDERS
Directorate of Aerospace Safety



■ There I was, hanging on the wing, fat, dumb, unhappy, in the thickest goo in the world. All of a sudden, ZAP!! The leader pulled a disappearing act. What now? Let's see, was it 30 degrees away for 15 seconds, 15 away for 30, what am I, nr 3 or nr 4? Okay, I guess I'm out of his way now, what comes next? Look at that hud, what's all that junk trying to tell me? Where's that ADI anyway? Let's see, Brown is down. . . .

Imagine yourself for a moment in the above situation trying to recall your lost wingman procedures. Being a fairly standard fighter jock myself, I have a difficult time getting motivated to remember all that gobbledegook about which way I turn for how many seconds, etc. I suppose that it's easy to sanctimoniously sit back in your easy chair and say, "A good pilot will mentally review his lost wingman procedures prior to penetration into known or suspected visible moisture conditions" or some such bureaucratic pronouncement like that; but in fact, it just isn't done. Why not?

Let me share a little personal philosophy to answer that question. First of all, how many fighter jocks that you know will ever admit that they fell off the wing? I certainly won't. Why the heck should I worry about that lost wingman thrash when I know in my heart that I'm good enough to hang on in a seven G night weather Immelmann? In other words, the best lost wingman procedure is to be good enough to prevent it in the first place. That, folks, is an elephant.

What I'm talking about here is an attitude that I suspect is consciously or subconsciously shared by a lot of people in the fighter community. I suppose you could call it an attack of "it can't happen to me" disease. Pride tends to effectively quell any burning desire to retain knowledge that only counts in stan/eval tests. Attitude notwithstanding, I think that other little gremlins at work here add to our problems.

Returning now to my lost wingman example, let's suppose that I was hanging on the wing and my leader decided to fly through some black paint. I will concede that under these circumstances even I, the world's finest fighter jock, just *might* have to go single ship. In th time compressed environment that present during a lost wingman situation, I have to be able to separate ants from elephants. I dou if any one in the whole world is capable of instant and total recall every little procedure that applies every situation. After all, the book is on the ground; when action is required right now, one can get himself in real trouble vainly tryin to remember what it says. There a a couple of things that you can do, however, that will keep your slim, trim body in one piece.

I have a friend who draws a

There is an old adage which states that "elephants tend to stomp on you while you're stomping on the ants."

actical parallel" for everything
at he does in an airplane. In the
ffic pattern, for example, he
esn't turn base; he rolls in on the
nway. The tactical parallel is one
his ways of separating ants from
phants. Basically, all he is doing
reducing every problem to
nageable size by defining the
portant stuff. In one way or
other, every good pilot uses
nilar devices. When your mind
just reached computer overload,
common sense, "KISS" (keep it
nple, stupid) approach is the only
y to fly an airplane.

A tactical parallel for the lost
gman bit might be: You have
gunned down a MIG-21 and are
ng to jink away from the
loding debris and duck into a
rby cloud to escape an Atoll that
hreatening your tailpipe. Far out,
ess, but it effectively illustrates
actions that will keep you from
ing yourself; namely: Get
aration and simultaneously get on
gages as you find yourself alone
he weather. Now that you've
ided your Leader— avoid the
ld— maintain aircraft control.
se two things are the elephants.

Vell, what about all that other
? If you can remember degrees
seconds for every conceivable
ation while under pressure, more
er to you; you're a better man
I. In the context of the situation
we are talking about, however,
rees and seconds are ants.
pose you were to turn 60 degrees
for 20 seconds or (God forbid) use 45 degrees of bank? I can tell you what will happen 99.99999 percent of the time. As long as you don't ignore the elephants, your wing stan/eval or local coroner will never know.

I'm not trying to teach anybody how to go lost wingman. After all, since I won't admit to any practical experience on the subject, I'd be a poor teacher. The lost wingman situation does provide a timely example to show my own personal philosophy on sorting out the important stuff. There is a considerable amount of evidence (mostly in the form of smoking holes) that shows that there are plenty of jocks around who have forgotten (or perhaps never learned) how to do that.

And that lack has been costly: Crews have run themselves into mountains because they were trying to stay VFR under the weather. I guess they thought that they would instantly vaporize if they went into a cloud without a clearance. One troop somehow managed to run into a grain elevator on a low pass. I wonder what was on his mind? About a million jocks have pulverized themselves looking at a pipper instead of the ground. And, last but not least, what about all of those low-level skip hits that have been going on? I'll bet a buck that some of those dead folks were gazing at a radar altimeter or some such device instead of the ground. I personally find it hard to believe that anybody could clobber something that he's looking at. And so it goes. . . .

Well, what can we do about it? Let me sign off with a few thoughts:

1. TO THE JOCK: Teach yourself to recognize the difference between ants and elephants. During every flying task that you perform, basic airmanship "elephants" will stomp on you unless you deal with them as first order of priority. By using the tactical parallel or some other "horse sense" logic device, you can effectively define one or two central actions from every written procedure or flying task that will represent the basic thing that you are trying to accomplish. Hang on to these one or two actions. They are usually vital to your continued well being.

2. TO THE INSTRUCTOR: You are singlehandedly capable of shaping the attitudes of your students. Concentrate your teaching energies to make sure that each one knows how to recognize and cope with the flying pitfalls that can kill him. Encourage him to think his way through every flying situation instead of merely reciting things and flying airplanes by rote.

3. TO THE STAFF TYPE: Remember where you once were and will be again. Does that syllabus, procedure, mission profile, test, or employment tactic that you are writing up adequately describe the elephants? Or does it assign equal weight to the ants? I really do wonder sometimes whether we are responsive to the needs of our jocks in this respect; it seems like an awful lot of our written work serves to confuse rather than clarify.

The bottom line— we all care— make sure we *do* separate the ants from the elephants. ■

U.S. NAVAL TEST PILOT SCHOOL ALUMNI

An effort is underway to update the USNTPS Alumni Records. To ensure your receipt of a Reunion/ Symposium invitation, please send your current address to:

Administrative Officer
U.S. Naval Test Pilot School
Naval Air Test Center
Patuxent River, Maryland 20670

Have you heard about this one?

MAJOR ROGER L. JACKS
Directorate of Aerospace Safety

"Statistics are like a bikini. What they reveal is suggestive, but what they conceal is vital."
Aaron Levenstein

■ Statistics show that since 1976 over 65 percent of the "heavy" (B-52, C-135, C-141, C-5 and C-130) Class A mishaps can be attributed to the operations area as opposed to logistics. Within that grouping we can identify a variety of crew and supervisor shortcomings. What we can't do in most cases is to identify the motive that caused the mishap to occur.

As noted management consultant, Peter Drucker says, "We know nothing about motivation. All we can do is write books about it." And, that is what we in the safety business have been doing; writing on the numerous factors that adversely motivate the aircrew member, i.e., stress, complacency, fatigue, mind sets, physiological and psychological limitations. A verbal shotgunning action in hopes of changing a few attitudes and preventing an aircraft mishap.

Recently, I came across an article by Marine Major C.L. Bacon in *Safety Sentinel* entitled the "Wild Hair Syndrome" that was another attempt to explain aircrew motivation. Major Bacon asks the question "Why in the world do sensible men, seasoned aviators, all of a sudden do something that they know is wrong, stupid or unnecessarily dangerous?" Bacon says the answer may be the Wild Hair Syndrome; giving in to an impulse to be reckless, irrational, lazy, unprofessional, or any number of other states of mind that are hazardous to your well being.

All of us at one time or another have been faced with the Wild Hair Syndrome, and I would venture to say we have all succumbed to its inviting challenge. It may not have happened to you in an aircraft yet, but odds are you have experienced its magnetism in your daily activities.

As fliers, we must avoid its devastating results. How? Major Bacon says by "realizing its symptoms, its onset, its characteristics; and, just as a bad case of hypoxia, take corrective action to avoid its fatal results."

"The most important factor is to remember that no one is immune to this syndrome— no one." Occasionally, a supervisor will have a crew member who is a "chronic crazy." It's the duty and responsibility of supervisors to get this person out of the cockpit. He'll be doing the crew member, our aircraft, and our mishap rate a favor.

A good hedge on the Wild Hair Syndrome is to read and heed the mishap lessons of days gone by. When an urge starts tingling one's skin to take an unnecessary and risky short cut or an impulsiveness to be reckless prevails, it pays to keep in mind all those things that have been tried before with a miserable success rate.

We very seldom come up with a really unique way of wiping

ourselves out in aircraft mishaps. It s generally just a variation of a ried and true method. George Bernard Shaw once said, "If history epeats itself, and the unexpected lways happens, how incapable must man be of learning from experience." Unfortunately, our ecent "heavy" Class A mishaps upport Shaw's position. Let's eview some of the "heavy" Class A's.

A C-135 was making an approach n weather and failed to level off at ninimum approach segment altitude nd impacted on the ground killing ll persons on board. Crew oordination, checklist procedures, orgetting to reset the altimeter and hannelized attention all contributed o this one.

Or, how about the "heavy" that fter taking off from home station ost its radar. Weather at the estination airfield was predicting hunderstorms for their arrival time. The crew pressed on. While enroute, hey were advised that hunderstorms were in progress and were forecast to remain in the area or their arrival time. The crew ressed on. In the vicinity of the estination airport the ground radar ontroller advised the aircrew that e could not provide vectors through r around the weather. The crew ressed on. The aircraft encountered xtreme turbulence, crashed, and illed all onboard.

How about a mishap with a ombination of supervisory and perational shortcomings. This crew as behind the power curve before e aircraft even took off. A newly upgraded aircraft commander was teamed with an inexperienced copilot and then sent to an unfamiliar destination with a visually deceptive runway. Add to this scenario, a copilot who had violated crew rest regulations and was in a questionable state of health to effectively assist the aircraft commander and you have an accident in the makings. During landing, the aircraft commander experienced a visual illusion, mistook the length of runway remaining, tried to initiate a go-around, stalled the aircraft and crashed.

Other human factor mishaps included the illegal use of antihistamines, poor or nonexistent crew coordination, using unauthorized methods for mission accomplishment, violation of the maximum flight duty period, IP's allowing students to exceed their capabilities and then not taking timely corrective action, inadvertently raising the landing gear, allowing unqualified crew members to perform crew duties and several incidences of improper supervision.

Do some of these sound familiar? Sure, they have occurred more than once in the past, and chances are they will cost us more aircrews and airplanes in the future, unless each aircrew member and supervisor makes a commitment to collectively attack the human factor mishap. A step in the right direction is guarding against the Wild Hair Syndrome.

A point to keep in mind is that the Wild Hair Syndrome has two modes of operation. It can be active or passive. We've discussed the active, here are a couple of examples of the passive. The supervisor who sees an unsafe act being committed, knows he should do something about it, but for some reason does nothing to stop the event from occurring. A passive action capable of producing deadly results. The same passive mode applies to aircrews. The crew member who is supposed to be monitoring the pilot's approach, and by all outward appearance it looks as though he is as he stares at the instrument panel. In reality he is in dreamland, blissful complacency, planning his weekend activities.

We've talked about the problem and its potential for being hazardous to a person's health. What we haven't discussed is how to avoid the Wild Hair Syndrome. The first step is being aware there is a phenomenon that entices people to do "off the wall" things. The second step is to believe it can infect anyone's thinking. In other words, we're all candidates. The next step is to recognize the onset symptoms. From this point on it is a matter of determination. Determination not to be one of its victims. ■

REFERENCES

Bacon, Major C.L., "Wild Hair Syndrome," Fourth Marine Aircraft Wing Safety Sentinel, *Vol VII No 4 Jul/Aug 1979.*

X-COUNTRY NOTES

This trip we visited about a dozen USAF installations and came across some items worthy of mention.

IDEAS AND NOTES

■ PPR—The PPR status is being used as a management tool by many airfield managers. This is not necessarily bad but needs to be closely monitored. If a condition or situation exists which calls for a prolonged PPR status, make sure that it doesn't turn into a crutch. If you really need to reduce the numbers of transients because of operational commitments or safety problems, you may want to think OBO instead of PPR. Bottom line—PPR used for sequencing or servicing priorities will not automatically make you ineligible for the Rex Riley award.

NOTAMS—Five out of ten bases I checked in one week had the hourly update NOTAM summary at least 45 minutes old and still posted. Something needs to be done with them—check it out! Those NOTAMs are the current status to the crews and going into a weather situation, they could mean land, divert or. . . . By the same token—crews need to spend more and more preflight time checking NOTAMs (effective time), IFR supps, FLIP documents and approaches prior to takeoff. There is a wealth of info about destinations, routes and alternates spread between many documents. Protect thyself!

MANNING—I don't pretend to know the intricacies of the personnel system, but I do know that something is wrong when you walk into Base Ops and the one dispatcher on duty is trying to answer PTD, process flight plans and manifests, and inspect pax at the same time. Although austerity is rampant, the Base Ops counter should carry a high priority for well-qualified personnel because they not only are the life blood of your transient program, but they also affect your local base aircraft and mission accomplishment. This is one area in which you cannot afford to stand short or inexperienced!

HIGHLIGHT NOTAMS—Something neat that a lot of folks used to do seems to have dropped by the wayside. It only takes a moment but really saves crew time, if someone will underline or highlight the names of the states on the NOTAM sheets. (Folks at AFCC say it's not taboo and it sure helps.)

MARSHALLERS—We had several instances where the TA personnel either put power on the aircraft or pulled chocks without being signaled. It's critical that the ground and cockpit folks communicate safely and correctly either by interphone or visual signals. It's probably a good time

for both aircrews and ground personnel to review AFR 60-11. ALSO—those who do any aircraft marshalling need to remember that they are the eyes and ears of the crew! It's not a position that can afford a half-hearted effort. By the same token, the aircrew has the responsibility of briefing the groundcrew as to procedures desired for preflight, start and taxi. Ground personnel can't read your mind and may not be familiar with your aircraft or local signals.

ATC SERVICES—We rarely say much about the approach control, tower, and ground control services at bases. We by no means want to slight the outstanding efforts by these folks, but we don't really know the nuts and bolts of their business. When we transit a base, we put down comments about service and communications, but if there seems to be a deep-seated problem, we holler for help from the experts in AFCC at Scott AFB.

RETAINED AWARDS

McCLELLAN AFB—Probably the most "together" place we stopped this trip. TA really tries; billets are good, Base Ops super, on and on. A good stop or RON. Watch the traffic—super high midair potential in the area!

FAIRCHILD AFB—Not enough time for a full check, but what we saw was good. Base Ops folks are conscientious and TA gave us outstanding service. Winter weather, strange fogs, and distant alternates make planning and weather checking good insurance.

OFFUTT AFB—Still lots of traffic and only one runway, but a good place to stop. Possible refueling delays for VIPs, but I've never seen the two hours as advertised. Dangerous crosswinds through the buildings and close taxi distances make vigilance a must.

ANDREWS AFB—Still climbing! New flight plan room and TA's working toward good service for all! They still have priorities and procedures that boggle the mind at times, but the attitude toward regular non-code transients is one of service.

No new additions to the list, but we stopped at some "not so shiny" places. The big items that busted these places have all been said before and if you go for a sum total, they add up to "attitude." Big or little, busy or not, regardless of MAJCOM, North, South, East or West—the key element is *attitude*. If the folks at a base can empathize with aircrews and work at providing safe, efficient service, the result is generally success! Good turns or bad . . . write Rex Riley, AFISC/SEDAK, Norton AFB, CA 92409. ■

REX RILEY
Transient Services Award

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AK
PETERSON AFB	Colorado Springs, CO
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TORREJON AB	Spain
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
NORTON AFB	San Bernardino, CA
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
CARSWELL AFB	Ft. Worth, TX
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayetteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND
VANDENBERG AFB	Lompoc, CA
ANDREWS AFB	Camp Springs, MD
PLATTSBURGH AFB	Plattsburgh, NY
MACDILL AFB	Tampa, FL
COLUMBUS AFB	Columbus, MS
PATRICK AFB	Cocoa Beach, FL
ALTUS AFB	Altus, OK
WURTSMITH AFB	Oscoda, MI
WILLIAMS AFB	Chandler, AZ
WESTOVER AFB	Chicopee Falls, MA
McGUIRE AFB	Wrightstown, NJ
EGLIN AFB	Valpariso FL

HATR PERSPECTIVE

■ What do you think about AFR 127-3, The Hazardous Air Traffic Report (HATR) program? Your job in the Air Force may have a lot to do with how you look at it. If you are an aircrew member, you might say:

1. What's an HATR?

2. It's a good way to tell people when someone else really screws up in the air.

3. It's a good near midair collision reporting system.

AJOR JOSEPH YADOUGA
ectorate of Aerospace Safety

4. It's not worth a ______!

If you are an Air Traffic Controller u might think:

1. It's pilot oriented and out to t the controller.

2. It's a good way to retaliate and t even with a pilot.

If you are a safety officer, you ght think:

1. It's a pain in the ______!

2. There is too much work in-lved. I've got more important things do than answer some pilot's com-int.

3. It is an effective way to identify l correct problem areas.

f you are a CATCO (Chief, Air affic Control Operations), you ght think:

. An HATR is a good way to get rouble with the Wing Commander with your area HQ.

. Your OER is affected by the nber of HATRs that your fa-ties receive.

f you are a headquarters safety air traffic type, you might view it ttle differently:

. It's a good way to measure the ctiveness of the safety program at e X.

. The number of HATRs at a ticular base tells me a lot about base's air traffic control system.

. The number of HATRs can tell a lot about the relationship be-en flying safety and air traffic trol.

here are others, too. This list is no means exhaustive. In 2½ years working with 127-3, I have heard ny other comments about it. Here ne way I see the HATR program. During the program's infancy (it an in June 1976), I was working with the FAA at Kansas City Center. As a result, when I arrived at the Air Force Inspection and Safety Center in the summer of 1977, I couldn't even spell HATR. I quickly learned how.

1. The HATR program is a good near midair collision (NMAC) reporting system, but is is more than that. It is a system for reporting and investigating all NMACs and air traffic conditions considered to be hazardous. NMAC's are a big part of it, but we want to attack these other problems early—before they result in a near midair or, even worse, a midair collision.

Improve aviation safety by identifying and correcting deficiencies in the air.

2. The goal of the HATR program is to improve aviation safety by identifying and correcting deficiencies in the air traffic and airspace system. These reports are not misdemeanors; therefore, they should be used for mishap prevention and not for disciplinary action.

3. The end product of an HATR investigation is not what is done to the controller or pilot, but what is done for the system. The actions taken must clearly be system improvements and readily perceived as such by all involved. The managers and supervisors involved must take pains to ensure that their actions fall within this context and are not misconstrued to be anything else.

4. By itself, the number of HATRs that base X has versus the number at base Y is meaningless. A high number of HATRs may be a positive indication that there is an extremely aggressive safety program at that base and that people are working together to solve their problems, and they are getting the word to the people who are in the position to do something about them.

5. An absence of reports is not necessarily proof that all is well and the operation is flawless. It could indicate a general lack of awareness of the HATR program and a lack of confidence in the capabilities and desires of supervisors and managers to correct the deficiencies without retribution to those responsible for making them known.

6. HATRs can tell us a lot about the effectiveness of the safety program, the ATC system, and the relationship between ATC, safety, and the flying organizations. But, it is not the number of HATRs that tells us these facts. It is the substance, the investigation, the manner in which problems were handled and corrected, that give us this information.

7. The HATR program does require hard work. It takes time to properly investigate a report. It takes time to prepare and send out messages. It takes time to effect changes in procedures or to educate people.

No matter how you look at it, it's worth the effort. ■

THE PROFESSIONAL APPROACH

Pilot's Role in Collision Avoidance

AIR FORCE COMMUNICATIONS COMMAND
Scott AFB, IL

■ During 1978, 34 midair collisions (MAC) occurred in the United States resulting in 190 fatalities. Of the 190 fatalities, 144 resulted from the collision between an airliner and a light airplane and included fatal injuries to seven persons on the ground. Most of the midair collisions occurred in good weather during the hours of daylight. During the same period, the FAA reported there were 495 near midair collisions (NMAC) in the US; a 29 percent increase over 1977.

Several significant programs designed to reduce the potential for midair and near midair collisions have been introduced (i.e., altitude readout, traffic conflict alerting, TCAs in highly congested areas). The need also exists for all pilots to recognize the human factors associated with near midair conflicts.

The following nine areas warrant special attention and continuing action on the part of all pilots to avoid the possibility of their becoming involved in midair conflicts:

"See and Avoid" Concept

The flight rules prescribed in AFR 60-16 and Part 91 of the Federal Aviation Regulations (FAR) set forth the concept of "See and Avoid." This concept requires that vigilance shall be maintained by each person operating an aircraft, when weather conditions permit, *regardless* of whether the operation is conducted under Instrument Flight Rules (IFR) or Visual Flight Rules (VFR). Pilots should always keep in mind their responsibility for continuously maintaining a vigilant outlook regardless of the type of aircraft being flown. Remember that most midair collision mishaps and reported NMAC incidents occurred during VFR weather conditions and the hours of daylight.

Visual Scanning

Pilots should look out in all directions and periodically scan the entire visual field. Remember tha performance capabilities of many aircraft, in bot speeds and rates of climb/descent, result in hig closure rates limiting the time available for detection decision, and evasive action.

The probability of spotting a potential collisio threat increases with the time spent looking outside but certain techniques may be used to increase th effectiveness of scan time. The human eye tends t focus somewhere, even in a featureless sky. I order to be most effective, the pilot should shif glances and refocus at intervals. Most pilots do thi in the process of scanning the instrument panel, bu it is also important to focus outside to set up th visual system for effective target acquisition.

Effective scanning is accomplished with a serie of short, regularly-spaced eye movements that brin successive areas of the sky into the central visua field. Each movement should not exceed 10 degree and each area should be observed for at least on second to enable detection. Although horizonta back-and-forth eye movements seem preferred b most pilots, each pilot should develop a scannin pattern that is most comfortable and then adhere t it to assure optimum scanning.

Peripheral vision can be the most useful in spottin collision threats from other aircraft. Each time a sca is stopped and the eyes are refocused, the periphera vision takes on more importance because it is throug this element that movement is detected. Apparen movement is almost always the first perception of a collision threat and probably the most important, because it is the discovery of a threat that triggers th events leading to proper evasive action. Visual searc at night depends almost entirely on peripheral vision In order to perceive a very dim light in a certain direction, the pilot should not look directly in this direction but scan the area adjacent to it. Short stops of a fe seconds will help to detect the light. Lack of brightness and color contrast during the daytime and conflicting ground lights at night increase the difficult of detecting other aircraft.

Pilots are reminded of the requirement to move one's head in order to search around the physica obstructions, such as door and window posts. These

osts can cover a considerable amount of sky, but small head movement may uncover an area which ould be concealing a threat.

learing Procedures

Prior to taxiing onto a runway or landing area for keoff, a pilot should scan the approach areas for ossible landing traffic by maneuvering the air-aft to provide a clear view of such areas. It is im-ortant that this be accomplished even though a taxi takeoff clearance has been received. During imbs and descents in flight conditions which permit sual detection of other aircraft, execute gentle anks left and right at a frequency which permits ontinuous visual scanning of the airspace about u. Execute appropriate clearing procedures before turns, abnormal maneuvers, or aerobatics.

irspace, Flight Rules, and Operational nvironment

Pilots should be aware of the type of airspace in ich they intend to operate to comply with the flight les applicable to that airspace. Aeronautical infor-ation concerning the type of airspace is dissemi-ted by three methods: aeronautical charts (pri-ary); the Flight Information Publication (FLIP) and rman's Information Publication (AIM); and the otice to Airman (NOTAM) System. The general erating and flight rules governing the operation aircraft within the United States are contained in R 60-16 and Part 91 of the FAR. General operating d flight rules governing the operation of aircraft tside the United States follow the guidelines and ocedures of the respective countries and the Inter-tional Civil Aviation Organization.

Pilots should use current aeronautical charts for e route and area in which they intend to operate. ey must note and understand the aeronautical gend and chart symbols related to airspace infor-ation depicted on the charts. They should develop working knowledge of the various airspace seg-ents, including the vertical and horizontal bound-es. A working knowledge of the specific flight es governing the operation of aircraft within the rious airspace segments should be developed.

Use the FLIP/AIM. Airspace segments and basic ot responsibilities for operating in the airspace are scribed in these manuals. New aircraft and related uipment require frequent FLIP updates. Operating ocedures are revised to meet these new require-nts. An example of new information is the airborne etches that were developed and modified to meet demands of new navigational guidance systems. ots must keep abreast of the latest changes in FLIP. Always obtain NOTAMs pertinent to your area of operation.

Pilots should also be familiar with, and exercise caution in, those operational environments where they may expect to find a high volume of traffic or special types of aircraft operation. These environ-ments include airport traffic patterns, particularly at airports without a control tower; airport traffic areas (below 3,000 feet above the surface within five statute miles of an airport with an operating con-trol tower); terminal control areas; control zones, including any extensions; federal airways; vicinity of VORs; restricted areas; warning areas; alert areas; military operating areas; military low-level high-speed training routes; instrument approach areas; and areas of high density jet arrival/departure routings, especially in the vicinity of major terminals and mili-tary bases.

Use of Communications Equipment and Air Traffic Advisory Services.

One of the major factors contributing to the likeli-hood of NMAC incidents has been the mix of known arriving and departing aircraft with *unknown* traffic in terminal areas with operating control towers. The known aircraft were in radio contact with some func-tion of the tower (local, approach, or departure con-trol) and the other aircraft were not in two-way radio contact and unknown to the tower at the time of the NMAC. This precluded the tower from issuing traffic advisory information to either aircraft.

Although pilots should adhere to the necessary communications requirements when operating VFR, they are also urged to take maximum advantage of the air traffic advisory services available to VFR traffic.

Flying in Formation

During 1978, several midair collisions occurred which included two aircraft on the same mission with each pilot aware of the other's presence. Pilots who are required by the nature of their operations to fly in formation are cautioned to recognize the high sta-tistical probability of their involvement in midair col-lisions. They must make sure that adequate preflight preparations are made and the procedures to be followed are understood by all pilots intending to participate in the mission. Always keep the other air-craft in sight, despite possible distraction and pre-occupation with other mission requirements.

Instructors and Flight Examiners

The role played by flight instructors in training pilots to conduct flight operations in today's increas-ing air traffic environment with maximum attention

continued on page 20

OPS topics

Shock Treatment

■ Recently, a loadmaster received a shock through his headset when lightning struck in the area. A static discharge traveled through wet ground and the interphone cord, which was laying on the ground. He had some temporary hearing loss. A weather advisory did not reach the flight line until five minutes after the loadmaster was shocked. A similar incident several months ago reportedly resulted in permanent hearing damage to another loadmaster.

Snow Fall/Downfall

Fresh snow and a gray-white winter day make up dangerous conditions for flying. The pilot has no shadows with which to gauge depth while in the air, and when trying to take off or land may find the runway condition deceptive due to the covering blanket of snow.

One pilot attempting to land on a snow-covered runway failed to notice a two-foot rise, just short of the runway threshold, due to the camouflaging effect of the snow. The nose gear struck it and broke off, causing substantial damage to the plane as it slid to a stop 300 feet beyone the runway threshold.

In another instance, a pilot was unable to distinguish the runway terrain from the air and in landing, struck a 15-inch high, ice-crusted snowdrift and nosed over. — Alaskan Air Command.

Smoke and Fumes Checklist

Ever wonder why the IP always berates you for putting your checklist and other sundry goodies on the instrument panel glare shield?

Other than the fact that the checklist can slide off the panel during takeoff and inflict grievous injuries, depending on where it lands, here is a better reason for not putting anything on the glare shield.

During the final phase of a formation approach, the C-130 copilot placed his checklist on the glare shield above the instrument panel. In the landing flare the copilot noticed smoke coming from the area of the checklist and wind shield. He picked up the checklist and it immediately burst into flames. Quickly, he dropped it to the floor and stomped out the fire with his size tens. Smoke, fumes and no doubt some confusion followed, but the crew was able to complete the formation landing (as well as the smoke and fumes elimination checklist) without further incident.

What happened? When the copilot tossed the checklist on the glare shield, the wire binder on the checklist cover made its way under the rubber boot that shields the windshield heat electrical terminal. Contact! Current flowed through the wire, heated it up, and set the checklist binder on fire.

There is nothing proposed to make checklist binders out of Nomex, but we can tell you that the glare shield is not a good place to store anything. — Sqn Ldr John C. Griffiths, RAAF, Directorate of Aerospace Safety.

ouble Check

Several F-4 units re- orted some defective two- ay check valves on the cape system pneumatics. s a result, a number of e MAJCOMs directed eir units to accomplish a e-time inspection of the stem by doing a conti- uity check with air and ggested renewed em- asis on proper mainte- ance procedures. The air ntinuity check requires sconnecting pneumatic d ballistic components d then reconnecting em afterward.

An F-4 WSO initiated sequenced ejection due an apparent out-of-con- l condition below 10,000 feet in bad weather. His ejection was without incident, but the pilot's seat did not eject. Fortunately, the pilot was able to recover the aircraft and land it.

The connection between the two foregoing paragraphs is the fact that the pilot's seat did not eject because the canopy did not jettison. It did not jettison because a double-check valve in the system had been left disconnected. The fix? Another one-time inspection – visual only, though. – Mr. Delgado, Directorate of Aerospace Safety.

witchology

The A-37 pilot was mber 2 in a flight of ree on a syllabus train- g bombing mission. The rcraft was configured ith B37K-1 practice mb containers. The Lead iefed to use the "manu- " mode and "pairs" so to pickle a bomb from ch outboard rack on the st pass. Number 2 asked questions of Lead, even ough he later said he was unsure of the required switch settings. As the flight entered the range, number 2 calculated that the only way he could obtain the "pairs" function was to use the "drop" side of the mode selector. He set the switches and confirmed the lights. On the first pass – you guessed it – both outboard bomb racks departed the aircraft. Moral – if you don't know – ask. P.S. His score is not available. – Major James Gillespie, CF, Directorate of Aerospace Safety.

Disorientation

■ After flying 6 hours, crew was assigned a routine night flight. Both pilots were slightly perturbed over having to make the flight. Pilot was known to be apprehensive in the past about night flights. As the helicopter approached the field, pilots asked that tower lights be turned off because they blinded them. Tower obliged, with the only remaining light coming from flashlight held by ground handler. Pilot continued approach without turning on landing lights or searchlight. Aircraft hit ground 75 to 100 yards short of touchdown point, appearing to fly into the ground in a normal descent attitude. Terrain elevation at impact site was 30 feet higher than the area at nearby control tower. Seconds before crash, crew chief heard copilot ask pilot if he wanted the landing lights or searchlights turned on. Pilot replied, "Yeah, I guess so.

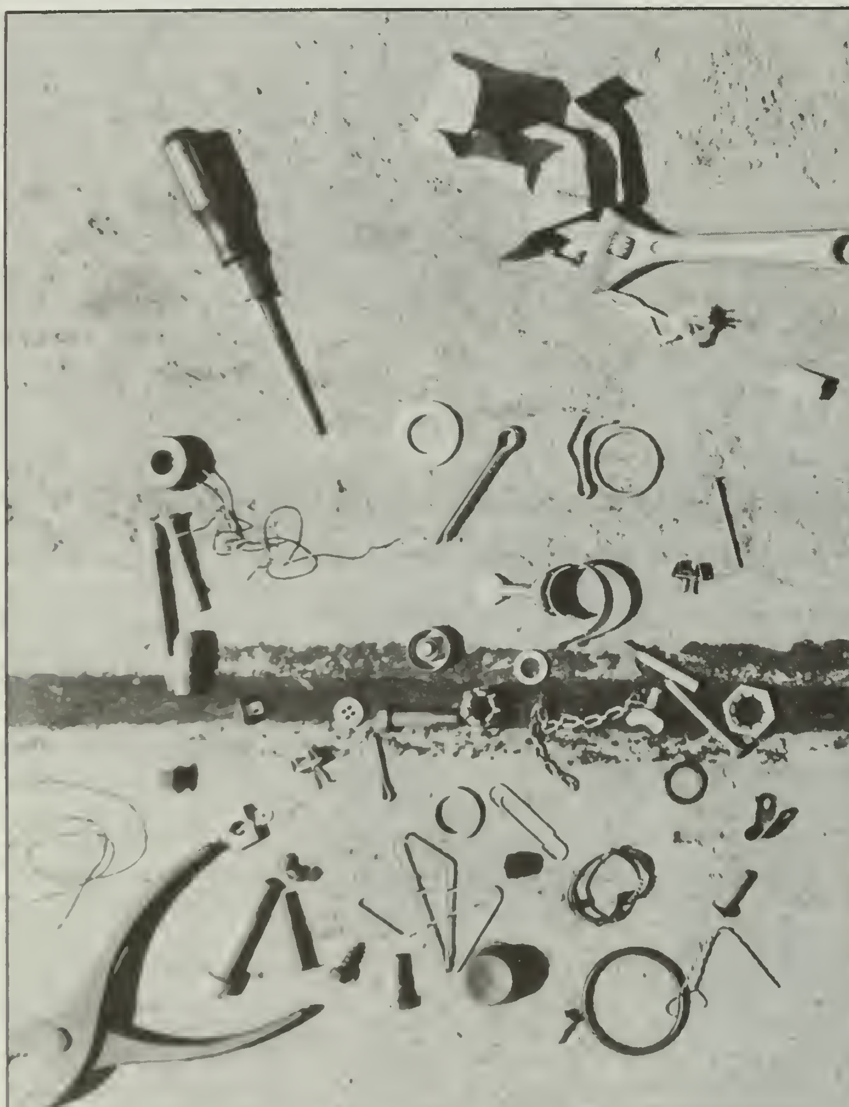
■ After refueling at night, pilot lifted aircraft to hover and moved toward a nearby tiedown, using the aircraft search light to maintain ground reference in the poorly illuminated area. Dust on the surface of the taxi strip was lifted into the rotor wash, resulting in IMC. With the searchlight still on and reflecting from the dust cloud, pilot tried an instrument takeoff. Aircraft hit ground in nose-low attitude, bounced, and went into right turn with rotor hitting ground at 45° angle. – Courtesy *Flightfax.*

Near Midair

The USAF aircraft was on final when the pilot was issued a traffic advisory for traffic at 11 o'clock. The pilot, however somehow fixed 3 o'clock in his mind. Surprise! Several seconds later he saw a civilian twin pass under him from left to right about 200 feet away. This is a case of that classic term, channelized attention. Sometimes it is an altitude (descending to 2,000 the aircraft struck a hill at 6,000). In this case the pilot apparently locked on 3 o'clock and didn't scan much elsewhere, even tho there was no traffic at 3 o'clock. ■

Battle status report...
USAF versus FOD

MAJOR PHILIP M. McATEE • CAPTAIN WILLIAM E. KOHLENBERGER • Directorate of Aerospace Safety



■ Engine foreign object damage nothing new to us; however, recentl use of our total repair cost reportir coupled with the ever increasing co of new materials have highlighte the consequences. We now see mo clearly the high dollar cost of th preventable damage and its effe on our mission capability.

The battle against FOD has bee on for some time now with actic continuing on several fronts. Bu how are we doing? Are we winning The answers to these questions a not clear-cut!

In Figure 1, we see the dollar co of FOD for 1977, 1978 and throug August of 1979. Several rule chang make the table a little difficult to i terpret. First, in 1978 we began use a table in AFR 127-4 which d picts average overhaul costs f engines returned to the depot f repair. Formerly, we had used percent of the engine's cost. Also January 1979, we changed the low limit for Class B mishaps from 10,00 to 50,000 dollars which is reflecte in the shift from Class B to Class mishaps.

But still you can see that FOD continuing to cost us a lot.

Which aircraft causes us the mo FOD? As you can see in Figure the principal "players" remai similar from year-to-year. Fighte attack/trainer aircraft always tak the lead, mainly due to the fact th there is a lot of structure and, ther fore, a lot of maintenance going c *in front* of the intakes. Howeve there has been a really significa reduction in F-4 FOD this year whic is very encouraging. It looks lik many of the MAJCOM's program

Figure 1

FOD COSTS	1977	1978*	JAN-AUG 1979**
CLASS A	NONE	NONE	NONE
CLASS B	6,201,750	5,357,823	1,167,336
CLASS C	925,216	557,986	2,165,286
GROUND	1,959,100	1,511,398	1,212,916***
TOTAL	9,136,066	7,427,207	4,545,538***

*Actual cost for depot overhauled engine by AFR 127-4 Table—Jan 73
**Mishap cost categories changed—Jan 79
***Incomplete due to ground mishap time limit.

Figure 2

FOD RATES (HIGH A/C)
(INTENT FOR FLIGHT ONLY)

MDS	(1977) NUMBER MISHAPS	RATE*	MDS	(1978) NUMBER MISHAPS	RATE*	MDS	JAN-AUG (1979) NUMBER MISHAPS	RATE*
F-4	154	18.34	F-4	167	21.00	F-4	67	12.57
F/FB-111	35	38.31	F/FB-111	36	22.57	T-38	30	6.89
F-15	12	14.16	C-130	30	2.15	F/FB-111	29	23.07
A-10	4	11.96	A-10	23	25.80	F-15	22	17.75
F-5	3	5.78	F-15	19	13.76	F-5	10	23.31
			F-5	8	13.08	C-130	9	.93

*Rate per 100,000 engine hours.

Figure 3

FOD CAUSES (HIGH A/C) 1978

	UNDETER.	BOLT, SCREW, NUT RIVET FASTENER	A/C HARDWARE (OTHER)	METAL OBJECT	TOOLS, FORMS, RAGS, HEADSETS, FLASHLIGHT	ASPHALT, ROCKS, CONCRETE	SAFE PINS, GROUND WIRES	AGE, COVERS	RICOCHET	TOTAL	ICE (NOT IN TOTAL)
F-4	43	67	10	27	11	2	7	0	0	167	0
F/FB-111	11	10	3	4	3	1	1	0	0	33	3
A-10	4	10	4	0	0	0	0	0	0	18	5
F-15	8	4	3	2	0	1	0	0	0	18	1
F-5	1	4	0	0	2	1	0	0	0	8	0
F-105	2	1	0	1	0	1	0	0	0	5	0
TOTAL ALL AIRCRAFT	117	119	22	38	27	15	9	1	0	348	18
MISHAPS %	117 33.6%	141 40.5%				90 25.8%				348	

Figure 4

FOD CAUSES (HIGH A/C) 1979
(THRU AUG)

	UNDETER.	BOLT, SCREW, NUT RIVET FASTENER	A/C HARDWARE (OTHER)	METAL OBJECT	TOOLS, FORMS, RAGS, HEADSETS, FLASHLIGHT	ASPHALT, ROCKS, CONCRETE	SAFE PINS, GROUND WIRES	AGE, COVERS	RICOCHET	TOTAL	ICE (NOT IN TOTAL)
F-4	34	19	7	6	0	0	0	0	1	67	1
T-38	15	1	5	1	5	1	0	2	0	30	0
F/FB-111	9	8	2	5	1	3	0	1	0	29	0
F-15	10	8	1	0	1	1	0	0	1	22	0
F-5	4	1	0	3	1	0	1	0	0	10	0
C-130	9	0	0	0	0	0	0	0	0	9	0
TOTAL ALL AIRCRAFT	109	50	19	16	8	8	2	3	2	217	25
MISHAPS %	109 50.2%	69 31.8%				39 18.0%				217	

are beginning to prove their worth. On the other side of the coin, several aircraft rates, including the T-38 and F-5, have increased—showing a need for more attention.

In Figures 3 and 4, we show the aircraft with the highest number of FOD mishaps by cause for 1978 and through August of 1979. The lower part of each table shows the totals for each of our subjective causes for all USAF aircraft. We have broken the causes into three groups and each group's percentage of the totals:

- Undetermined.
- Hardware we believe came from the aircraft.
- Objects external to the aircraft.

Since FOD caused by ice is not included in the rates but is becoming significant, it is shown on the right of each table.

One area that really hurts, is the large number of undetermined FOD mishaps we have each year.

It appears that we are coming to grips with the aircraft hardware problems but still need to improve on the "carelessness" type of mishap. And the carelessness is not confined to

maintenance personnel. Aircrew hats, let-down plates, maps and pencils also are taking their toll.

In Figure 5, the significant increases and decreases by MAJCOM are shown. Again, note the improvement in the TAC and USAFE F-4 rate. We will let each reader draw his own conclusions about what caused the changes. However, we do know that in several of the improved areas, a lot of effort was expended.

One area that really hurts, is the large number of undetermined FOD mishaps we have each year. When we know what caused the FOD, we are able to take preventive measures, i.e., hardware modifications or procedural changes, but when the cause is undetermined, there is very little we can do. Our statistics tend to bear this out. On the undetermined mishaps, we have made no headway at all.

So we *do* need better FOD investigations. Often when we really try, a lot can be learned about the source of the foreign object. Such questions as: What maintenance was last performed? what panels were last removed? what was the aircraft's history since its last flight? are there any impressions on the blades? etc., will quite often give the investigator clues. Of course, a complete inspection of the aircraft for missing hardware (include a check of other aircraft on the same mission) should always be performed. The answer may not appear until the engine is opened and bits of residue are found.

But please make sure your investigation is as complete as possible before you give up. Make "undetermined" a cause of last resort because we all lose.

Well, the war is still on. What can you do to help? We have made a list of what we believe are the requirements for a successful FOD program:

- *Attitude* – A concerned attitude from the commander on down.
- *Education* – To ensure people are aware of the unique hazards.
- *Motivation* – To keep FOD prevention on people's minds.
- *Enforcement* – To ensure correct Ops and maintenance practices are being followed.
- *Through Investigation* – To find the cause, correct it and prevent recurrence.
- *Correct and Controlled Hardware.*

There are several practices which, if strictly followed, will go a long way to help us in our battle:

- Adequate taxi intervals.
- Effective sweeper program.
- Effective tool control program (CTK).
- Nondestructive inspection (x-ray).
- Controlled bench stock.
- Intake repair rivet accountability.
- Use of bunny suits.
- Protective covers for intake and openings.
- Proper maintenance of intake screens.

So it appears that we are making progress, but the battle is far from over. Remember, FOD is preventable, but to win this war will take an all out effort from everyone starting with the commander and going down to the newest crew chief or technician. We *can* win! Now, let's all really start to fight! ■

Figure 5

FOD MISHAP COMPARISON
BY MAJCOM/AIRCRAFT
JAN-AUG 1978 vs JAN-AUG 1979

INCREASE				DECREASE			
ACFT/ MAJCOM	1978	1979	CHANGE	ACFT/ MAJCOM	1978	1979	CHANGE
ATC T-38	12	28	+16	TAC F-4	59	26	−33
TAC F-111	11	20	+ 9	AFE F-4	33	12	−21
TAC F-15	10	17	+ 7	TAC A-10	12	3	− 9
MAC H-1	1	8	+ 7	MAC C-130	14	5	− 7
ANG A-7	0	8	+ 6	SAC B-52	9	4	− 5
AFE F-15	2	7	+ 5	AFR C-130	5	1	− 4
TAC F-5	4	8	+ 4	LDG C-130	4	0	− 4
AFR A-37	0	3	+ 3	AAC F-4	9	5	− 4
ANG C-130	1	4	+ 3	AFR F-105	4	1	− 3
ANG F-4	3	6	+ 3	MAC T-39	5	2	− 3
ANG F-105	0	3	+ 3				

	1978	1979	CHANGE
TOTAL NR	292	255	−37
TOTAL $	$4,351,188	$4,545,538	+$194,352

letter to rex

■ Aircrews frequently have difficulties completing the DD Form 175 because they don't fully understand the form and subsequently, just what information is required. Here is a quick look at some of the problem areas:

■ Initial Cruising Altitude—The entry in this block of the 175 indicates the altitude or flight level requested for the first leg of flight. If there will be known altitude changes en route, you have the option of indicating the proposed altitudes and location in the flight plan remarks section, e.g., "FL350 at ABQ," or when airborne, request altitude changes by voice with the Air Route Traffic Control Center.

■ Standard Instrument Departure—The SID is designed to provide a safe, orderly transition from the departure end of the runway to the en route structure. When available, the codified SID identifier should be entered, or if there is no code, then enter the SID name and number. Some flying units collect SIDs from various bases and pilots going out on stopover flight plans use them when departing stopover locations. SIDs, like everything else, frequently change, and normally only the departing Base Ops can be counted on to have the up-to-date SID for that airfield. The bootlegged copy in the squadron could be noncurrent. When a Radar Vector or VFR climb type of departure is desired, the pilot will indicate this request in the remarks section of flight plan. Next to the SID data is the "TO" block. When a SID is used, you should enter "Termination Point" or published Transitional Fix using the coded transitional identifiers, if available. If a Radar departure or VFR climb is requested, enter the fix planned for entering the route structure.

■ Hours of Fuel on Board—For filing purposes, this block should reflect that enough fuel is available to cover every event shown on the 175 plus reserve. Events include, but are not limited to: ETE to destination, en route delays, ETE to alternate, time for required penetrations and other preplanned approaches and patterns at destination. If inflight refueling is anticipated, then additional flight time available will be shown.

■ Distance to Destination—If you file a VFR flight plan, the distance is from the base of departure to the base of destination. For IFR, it is from departure base to the initial approach fix for approach to destination or initial approach fix for STAR routing. On stopover flight plans, the distance used is based on distance from originating base to first stop.

■ Flight Plan Approving Authority—The pilot-in-command will sign as approving authority on the DD Form 175 if he possesses his own approving authority (all Air Force pilots with instrument ratings possess their own approval authority unless it has been specifically withheld). The pilot-in-command will sign the "Pilot-in-Command" block of the flight plan if not acting as his own approving authority. Normally, the only time the pilot-in-command block will be signed is when a student pilot is flying a solo mission. If the flight is a formation, the pilot designated as Formation Commander signs as approving authority. His is the only signature required as long as he is indicated as the pilot-in-command. His signature indicates that each pilot member of the formation possesses an instrument rating if any portion of the flight is to be conducted under IFR conditions, and that he is aware of his responsibilities for the safety of the aircraft/formation and its occupants.

■ Remarks—There are two different types of remarks. The first type is anything essential to the safe and efficient control of air traffic, such as refueling altitudes, aircraft equipment limitations (i.e., TACAN only), military training route information, departure requests (i.e., radar vectors, VFR climb) and etc. The second type remark involves data for an informative nature that is passed between bases. For example, VIP/passenger/cargo codes, mission identification code and servicing requests are among the types of information that are included.

That's a quickie on some of the 175 entries that aircrews frequently question. The thing an aviator should remember when filing a flight plan is that he is using the 175 to communicate with several people. Write clearly, keep it simple, and exercise common sense. ■

Gin and... SODA?

COLONEL WILLIAM F. BELK, MC • Directorate of Aerospace Safety

■ Not too long ago, I asked for a gin and tonic in an Army Club and the waitress served me a horrible tasting concoction. After trying unsuccessfully to get her to exchange it for the real thing, she told me:

"We can't serve tonic water. The quinine in it is dangerous. An Air Force pilot crashed and they found it was due to tonic water."

Army policy required temporary grounding of any pilot who drank quinine water. So, the club simply substituted soda whenever tonic was requested.

The waitress didn't have all the facts straight, but that little bit of hospitality certainly enlivened the conference we were attending.

True, quinine is a drug with considerable toxicity. Quinine ingestion can even be fatal; however, drinking more than one's weight in tonic water would be required to reach that dose. When quinine is used therapeutically, at much lower doses (equivalent to seven liters of tonic water three times a day), toxic symptoms still occur frequently. Most often these are ringing in the ears, nausea, headache, visual disturbances, loss of hearing, and vertigo. Some individuals are much more susceptible and develop symptoms after a single dose or with small repeated doses.

Quinine undoubtedly can be dangerous, but the evidence that drinking tonic water leads to aircraft accidents is not quite as strong as the waitress indicated. In the mishap that precipitated the current concern over tonic water, neither the safety board nor any of the review authorities listed quinine as a cause. They concurred in the opinion of an independent expert that it may *possibly* have contributed to the difficulty the pilot had in resolving his disorientation but did not cause the disorientation. Prior and subsequent mishaps with that particular aircraft type lend credence to the latter conclusion.

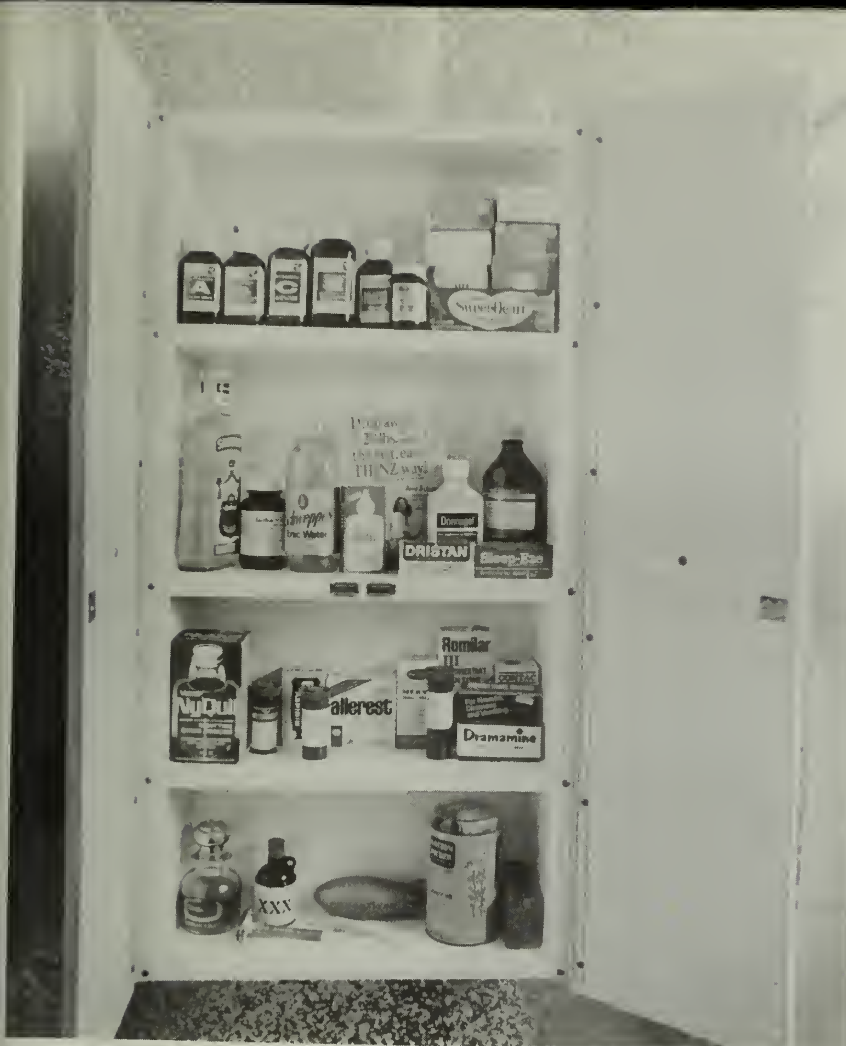
On the other hand, the possibility that very small amounts of quinine could affect equilibrium functions of the inner ear has been demonstrated in the laboratory. Further studies will be necessary to quantify the effect and to shed light on the real importance of this finding. In the interim, it might be prudent for aircrew members to eliminate tonic water from their diet. While neither the USAF Surgeon General nor the USN Surgeon General recommended grounding of aviators drinking quinine water, they both took interim action to publicize the possible adverse effects and caution aviators against use of tonic water.

The root problem is considerably bigger than the current concern with quinine. On a daily basis, we are exposed to a wide variety of substances that could have adverse effects on performance. The home medicine cabinet is the source of most of these substances but others come in food and drink. Toxicologic studies on aircrews involved in mishaps show some have flown after taking prescriptions or over-the-counter drugs. Many of the latter are used so commonly that they are considered innocuous. Even when the adverse effect has been quantified and warnings published, prior experience may lead an individual to discount that advice.

Unfortunately, cold or hay fever maladies often are treated this way. Although the antihistamines they contain have been linked to accidents on the ground as well as in the air, most of us have used these prescriptions for colds and continued to drive our cars without being involved in a mishap. Accidents are infrequent occurrences. Even if the risk were doubled, they still would be infrequent, and most people would escape unscathed. That type of personal experience often leads one to continue to ignore the warning, perhaps in a more demanding environment.

A side effect common to all antihistamines is sedation. They dull the mind and slow reflex activity. Other side effects include dizziness, ringing in the ears, lassitude, incoordination, fatigue, and visual disturbances. Faced with the evidence of therapeutic levels of the drug and obvious failure of the crewmember to perform, USAF aircraft mishap investigation boards have attributed some accidents to ingestion of these drugs.

In recent years, salicylates have been the drugs most often found on



toxicologic study of aircraft mishap crewmembers. Aspirin is the most frequently used drug in the salicylate group. No USAF aircraft accidents have been attributed to aspirin ingestion, but annually in the US, salicylates cause more poisonings than any other single agent. Among the side effects important in aviation are gastric distress, nausea, vomiting, tinnitus, vertigo, and hypersensitivity. Aspirin also increases the metabolic rate and oxygen consumption as well as causing changes in acid-base balance. It is estimated that 0.2 percent of the population will develop hypersensitivity to aspirin. This is usually manifested as an asthma-like reaction or, less frequently, as a rash. One doesn't need these distractions while trying to fly an airplane.

The belladonna alkaloids are frequently found in over-the-counter cold prescriptions, as well as in many prescription drugs for gastrointestinal disorders. They are used to reduce secretions of the nose, mouth, and respiratory tract and reduce motility of the intestines. These substances also can affect pupil size and accommodation, resulting in undesirable visual side effects. In addition, many of the prescription drugs for G-I disorders contain phenobarbital for its sedative effect. Mild sedation and disturbances in vision are acceptable when you're at home and at rest, but not while piloting an aircraft.

Many other types of drugs are readily available. The tranquilizers generally have a sedative action, slow reflexes, and decrease vigilance. Their specific anxiety ablating actions may further delay emergency responses. Sleeping pills and over-the-counter sleep aids have some not so obvious disadvantages. They can interfere with the quality of sleep, leaving individuals less rested than if they had obtained natural sleep. Diuretics and other high-blood pressure medications can cause weakness, fainting, or decreased tolerance to gravitational stress. (Hypertensive aircrew members whose blood pressure is controlled by certain medications, whose condition is stable, and who are under appropriate close medical surveillance can be acceptable risks. This is not true if they are taking drugs which have not been adequately tested for the flight environment, their dosage is not controlled, or they are not under proper medical surveillance.) Perhaps the most important thing to remember is that all drugs have side effects that can reduce your ability to perform to your maximum.

Equally as important as the drugs and their side effects are the underlying illnesses. Virtually all the conditions for which drugs could be taken will interfere with an individual's performance. At the very least, the symptoms will be distracting. At worst, sudden pain may obliterate all other sensory input.

How about food or drink? Today's crewmember knows alcohol will impair his performance, but may be surprised at how little is necessary. In recent years, the direct effect of alcohol hasn't been a problem in USAF aircraft accidents. Yet, 72-hour histories indicate that either many of the individuals involved in mishaps are remarkably hangover resistant or they don't believe morning after symptoms will interfere with their ability to fly. Some have added one or more drugs (aspirin and antacids) presumably to calm the symptoms before boarding their airplanes. Odds being what

Gin and... SODA? continued

they are, those individuals are likely to function much better with the aspirin than they would with the headache, but the best answer is to avoid the hangover in the first place.

In the beginning, vitamins came to us in our food. Today they seem to come in case lots by way of the local health food store. If you eat a balanced diet, aren't pregnant, and don't have a disease that interferes with absorption of nutrients, you don't need vitamin pills. Excessive vitamin intake can be toxic. This is particularly true of vitamins A and D. Excessive amounts of some of the others may not harm you, except in the pocketbook, but they're not going to help you either.

If the plug were suddenly pulled on all the coffee pots in the Air Force, the immediate disruption of productivity and job satisfaction would likely be devastating. There is no good evidence that a cup of coffee in the morning is harmful to a healthy individual. However, coffee and tea contain caffeine, a potent stimulant. One to two cups of either beverage are equivalent to a therapeutic dose of caffeine. At this level, its main actions are to speed the thought process, decrease reaction time, reduce fatigue, increase sensitivity of the senses, improve the quality of thought, and increase intellectual stamina. It also has a variety of effects on the heart, blood vessels, kidney, and gastrointestinal tract none of which poses any particular problem for a healthy adult. At higher doses, however, it can result in disturbing symptoms such as restlessness, excitability, disturbed sleep, irregularities of heart beat, and tremor. With coffee, a whole lot is not better.

Today you are flying aircraft in training scenarios that allow very little margin for human error. Competitiveness, pride, and motivation drive individuals to stretch the limits of their capabilities during exercises. The decrease in alertness accompanying a minor illness or self medication may cost you your life. Neither your family nor the Air Force can afford that loss. ■

The Professional Approach continued from page 11

to collision avoidance cannot be overemphasized. Flight instructors must set an example in carefully observing all regulations and recognized safety practices, since their students will consciously or unconsciously imitate the flying habits of their instructors. Flight instructors should guard against preoccupation during flight instruction to the exclusion of maintaining a constant vigilance for other traffic. They should be particularly alert during the conduct of simulated instrument flight where there is a tendency for the instructor to "look inside." Special training emphasis must be placed on those basic problem areas of concern mentioned here where improvements in pilot education, operating practices, procedures, and techniques are needed to reduce midair conflicts. They should understand and explain the limitations of radar that frequently may limit or prevent the issuance of radar advisories by air traffic controllers.

Flight examiners should direct their attention to the applicant's vigilance of other air traffic and adequate clearance of the area before performing any flight maneuver. They should direct their attention to the examinee's knowledge of the airspace, available air traffic services and facilities, essential rules, good operating practices, procedures and techniques that are necessary to achieve high standards of air safety.

Scan Training

Effective scanning techniques, as outlined above, are essential to the "See and Avoid" concept. Each pilot should receive extensive training in these techniques. The Aircraft Owners and Pilots Association (AOPA) Air Safety Foundation has developed an excellent education program designed to inform pilots on effective visual scanning techniques. The program, called "Take Two and See," is available on loan through the AOPA Air Safety Foundation, 7315 Wisconsin Avenue, Washington, D.C. 20014.

As you can see, the pilot's role in the prevention of midair collisions is critical. Improvements in pilot education, operating practices, procedures and techniques, as outlined above, can greatly reduce midair conflicts. And remember, regardless of whether you are operating IFR or VFR, always adhere to the "See and Avoid" concept.

The preceding article is an adaption of FAA Advisory Circular 90-48A, adapted by Maj James Smith, HQ AFCC/FFS. ■

the big sleep

MAJOR WILLIAM R. REVELS • HQ 15 AF • March AFB, CA

Early morning wake-ups are tough best; the unexpected ones are ways murderous. A T-39 alert crew und themselves groping for lephones at "O-Dark: THIRTY," oaning at the news of an unplanned ission.

The scenario wasn't totally ifamiliar. A Friday alert day, with tle chance of flying, and lots of ings to do around the house. Crew st? Sure, a nap later— then early to d tonight. The day passed without cident and evening came around th no mission assignment. A quick ll to the command post confirmed y suspicion that nothing was ewing. Might as well catch the ening movie, then hit the sack. ot really a bad day— the grass is t, pool cleaned out, garage uncluttered, and the living room rearranged. The wife is happy, the chores are done, and there's a whole weekend left for golf. By midnight, the world was truly a rosy place.

The sting came around 0200. Unexpected maintenance problems with the scheduled aircraft. Brigadier General Humphrey Bogart has a speaking engagement in Denver. Takeoff time is at 0400, but hustle because the ceiling is dropping at Denver. Grim news for a sleepy fellow to say the least, but no hill for a climber. One cup of coffee on the way to Base Ops, then another after level-off should clear out the fuzzies.

Adrenalin is great for demanding situations. The body nearly always comes through under stress, no matter how ill-prepared it may be. This particular mission was no different. The weather held at 400 feet, General Bogart was profuse with gratuitous remarks, and the world was beginning to look rosy again. First a little breakfast, then a quick flight back to home station. Probably have time for the front nine holes before dark.

The trip home was dull. Good weather, light traffic, with a little shut-eye here and there— taking turns, naturally. The past 24 hours had been tough, with all that work yesterday, two hours sleep, then the slam-bang trip to Denver. The final descent and approach were welcome relief. Fifteen more minutes and it would all be over.

It very nearly was all over. At 10,000 feet, the approach controller corrected the cleared altitude from 5,000 feet to 7,000 feet for a light civilian aircraft in a slow climb. The additional 2,000 feet would allow plenty of separation for the Cessna to pass underneath. The clearance drew a "Roger" from two groggy pilots, as the periodic naps were now beginning to overlap. Indeed, both of these gentlemen were asleep when the twin Cessna entered a wild gyration to avoid their T-39.

Needless to say, the incident got some attention from the FAA, the squadron, and the guy in the Cessna. No damage was done, no careers were destroyed, and bad feelings were eventually smoothed out. The point here is obvious, and small consequences have little to do with the situation. Perfunctory compliance with crew rest requirements is simply not acceptable. A moral, as well as legal, obligation to be adequately prepared for each flight is implicit with each set of flight orders. Our personal attention to individual preparation is the key to avoiding the big sleep. ■

The mission of the Air Force is to TRAIN ~~fly~~ and SURVIVE ~~fight~~ and don't you forget it!

MAJOR DAVID V. FROEHLICH • Directorate of Aerospace Safety

■ In the good ol' days of wandering around the Route Packs or MR's in SEA, we seemed to know who the enemy was! We were pretty well briefed on the threat whether it was AAA, MIGs or SAMs. We still got surprises once in awhile, but for the most part we knew who and what was out to get us. Not the case anymore! The major threat to operator survival has changed!

One of the most valuable post-war lessons we recognized was a need for realistic training scenarios to better prepare crews. From this need were developed extremely realistic exercises and low level route structures. Unfortunately, when you pump large doses of realism into training programs you also increase the risk of bashing bodies and birds. That's not to say that safety hasn't been considered and added to the formula, but risks are inherently increased when you go lower and faster more often. Add to those parameters the fact that the machinery is more complex, the scenarios more complicated, and the experience levels are creeping down. Deadly outlook!!!

Our new enemy (in the peacetime training environment) is the environment itself We (the operators) are tasked with training realistically to maintain a high level of combat readiness. In many cases we must do that training with reduced flying hour allocations, fuel conservation measures, and busier and more restrictive than ever airspace. The deck is really stacked! I don't think anyone is honestly surprised that as of 1 October 1979 we were ahead of the first 9 month's accomplishments (dubious wording) of 1978 in all aircraft mishap categories. As a matter of fact, we already had as many USAF pilot fatalities in 9 months of 1979 as we had all during 1978. When I say "not surprised," by no means do I mean happy or satisfied. I only mean that the numbers are much "as forecast." Lots of folks are tearing lots of hair out trying to figure out pat answers to make 1980 a safer and less fatal year than 1979 is turning out to be.

You as the operator are the only fix for the next year's mishap stats. All of the "MAJCOMs should" and "change T.O. XXX" and "brief all crews" mishap report recommendations may be for naught if the pole pullers and yoke manipulators in the green bags don't realize the odds they are playing against. You have to implant a caution light into your mission accomplishment "press" circuits. That caution may be because you're flying 370 knots in the weeds in a 25 year old machine, or doing the DACT dance only 6 months out of UPT or cracking minimums after 14 hours duty with an airplane full of PAX. Regardless, a lot of good folks are biting the bullet because they overcommit themselves. You *can* accomplish the mission safely if (and only if) you stack the

deck in your favor.

Stacking the deck in your favor includes the time-worn elements of knowledge, preparation, study, practice and all those things professional aviators know they have to do. The difference lies in the fact that 10 or even only 5 years ago we were training with older, more experienced folks with different parameters. Most of the work was done at least 1,000 or 1,500 AGL and often at slower speeds and lower AOA's. We're pushing and pulling the birds harder, taking 'em lower and faster, and doing it with younger, lower time folks. That calls for each operator to develop an attitude of airborne survival.

Go into the ring figuring that the elements are out to get you and you will be better prepared to survive! First and foremost – know your equipment systems and limitations. We've preached that since time began, but t's far more important than ever because of the environment we're now working. When you are killing anks at 100-300 feet, you have less ime to analyze one of those flashing ights.

Secondly – put some extra time n on target or route study. I've seen oo many collision with ground bashes hat hint maybe the operator(s) didn't now the lay of the land as well as hey might have. A term from one eport comes to mind – Pilot lost ituational awareness . . . and airraft impacted ground. "Situational wareness" is an excellent concept o think about. You as the operator an no longer afford to become even emporarily confused or disoriented vhile airborne. That little extra preparation may give you the edge. Unortunately, "situational awareness" overs a lot of territory. As an opertor your "situation" obviously inludes *your* position and parameters, ut also a wingman's or other flight nember's situation and such unprectables as weather, fuel, external affic and target condition or maneuering. Bottom line – "Situational wareness" is the biggee!

Lastly, from the operator's viewpoint, you need to be mentally willing to back down (knock it off, abort the route, etc.). I'm not saying not to strive to accomplish the mission, but for every set of circumstances you need a mental "no-go" point. For instance, it's a fact that most single engine drivers are much more aware of emergency airfields than multiengine folks. I did both, and I sure noticed a lot more runways as I wandered around in the T-bird than I used to in the fantastic Phantom.

Pushing and pulling birds harder, lower and faster with younger, lower time folks calls for each operator to develop an attitude of airborne survival.

My point is that we're losing good drivers when the "press" problem takes them into a corner they shouldn't have painted themselves into! Plan an "I quit" point for each pass, route, rejoin, engagement, or whatever; review it prior to the maneuver and then stick to the plan. The operator who knows the equipment and rules, studies the parameters and terrain to prevent surprises and sticks to the plan that has cut the odds against him.

The next key element in the risk-reduction process is the individual one step above the basic operator.

Supervisors have to have a finger on the pulse! Probably the most important "supervisor" in any organization is the individual with the "I" in front. Whether an IP, IAC, IN or whatever, the instructor is in the best position to mold the experience levels of others, recognize and document trends and evaluate the training programs and scenarios for merit and danger. Upper level supervisors (commanders, ops officers, etc) need to take a hard look at the communication channels to your instructor personnel. Can these folks get the ungarbled (and non-fearful) word up to you? If not, you may be wasting one of your most potent mishap prevention tools.

Too often I visit a squadron and in a bull session hear comments from IPs about tactics, syllabus problems or systems. Also, too often those comments are accompanied by the statement "You can't tell that to them up there, they don't care, they just watch the numbers." I'm here to tell you the numbers are bad! If the communication lines aren't open, an unsafe individual or practice may skate until he or it becomes a statistic.

Two last commercials – First, all of the above may seem slanted toward fighters and jocks who spend their time fighting over the western deserts. Not true. I've got as much time with eight engines as I do with one or two, and a BUF low level with race tracks or a CAM mission requires substantial "survival" instincts and cautions these days also. Some of the problems are different, but the risk is still there.

Finally – what's the outlook? Bleak unless positive individual operator action throws the trend in reverse. With no changes in attitudes and actions, there will be nearly 60-75 fewer pilots and 20-25 fewer other crew members to read my ramblings by the end of '80. Almost as catastrophic, there will be nearly 100 fewer aircraft for the survivors to fly. Our budget and National Defense posture cannot afford those kinds of losses.

We at AFISC will continue to study, analyze and publish to provide USAF with the best information possible with which to build mishap prevention programs. Only commanders can instill an attitude of "accomplish the mission . . . but only if it can be done safely!" in the troops. In combat, safety depends on survival against the enemy, but in the peacetime training environment, survival is dependent on safety of operations. Ultimately, *survival is up to the operator!* ■

Survival Working For You

SGT ROBERT J. ROBEL • Arctic Survival Training School • Eilson Air Force Base, Alaska

■ Nothing is more beautiful than evergreen trees peeking out from a cover of freshly fallen snow. But as Jack Smith woke on that October morning, this spectacle of icy wonder was terrifying. Just 2 days before, he, his wife Helen, and their two children, David and Julie, had left their home under sunny skies to camp for a few days in a mountainous region near their Idaho home.

"Helen and I were unprepared for the sudden cold and snowy weather and decided to head for home. We quickly packed the camping gear, loaded the kids in the car and traveled about 10 miles down the forest road. Suddenly, we hit an exceptionally slick spot and the car slid off the road. The axles were buried in the snow and ice and it was at least 20 miles to the main road. I began to panic and Helen began to cry.

"I sat there listening to her cry, realizing that if I didn't compose myself, my family could freeze to death while I watched. I really needed to remember the information drilled into me by the Arctic Survival School instructors. Who would ever think I would need to recall that information while on leave with my family. I suppose you never know when you'll be in a survival situation.

"As I desperately tried to remember what the instructors had said, the information started coming back in pieces. We would have to maintain our body heat in order to survive. This was extremely important! I recalled the instructors explaining that our bodies are like engines generating heat, and our clothing acts as insulation to maintain that heat. I remembered what the survival training instructor had said about dressing in layers; therefore, Helen and I began putting on shirts, sweaters, and jackets. The dead air space formed between layers of clothing keeps you warmer than just one heavy garment. They said that the key to maintaining good insulation and keeping warm was the word C-O-L-D. Now I could see how important this information was. If only I could remember what the letters in the word COLD stand for.

"I seemed to recall that 'C' represented keeping clothing *clean*. Clean clothing maintains heat in dry air spaces better than dirty clothing fibers. The 'O' had to do with *overheating*. By layering our clothing, if we become too warm, we could remove it as needed. The 'L' was to remind us to keep our layers of clothing *loose* fitting in order to create dead air spaces. Last of all, the 'D' in the word reminded us to stay *dry* – wet clothes are cold clothes!"

After building a fire to keep Helen and the kids warm and dry, Jack began setting up the tent. Gunshots of hunters in the area could be heard and Jack wished he had some means to signal for help. It would have been foolhardy to try to find them, for without a map and compass, he surely would have become disoriented. Their best chance for survival and rescue now seemed to be to set up camp and stay put. Sooner or later someone would find them.

While setting up the tent, those lectures kept coming back. Jack's instructor had said, "Metal and other substances conduct cold;" this was reinforced when his fingers began sticking to the metal rods of the tent. Without gloves, Jack returned to the fire to warm his hands while Helen began rummagin through their belongings to find enough wool socks to use as gloves He was greatly relieved to see they had enough for all, because he knew that a great deal of heat escapes through the hands.

By now the wind was blowing hard and he remembered the surviva instructor talking about convection,

or the loss of body heat due to moving air masses. This reminded him that he had better get their necks covered. The neck area too, is a great source of body heat loss. Helen decided that towels would double as scarves quite nicely. They laughed as they realized that they must have created an unusual, if not comical picture, with towels around their necks and colorful wool socks on their hands.

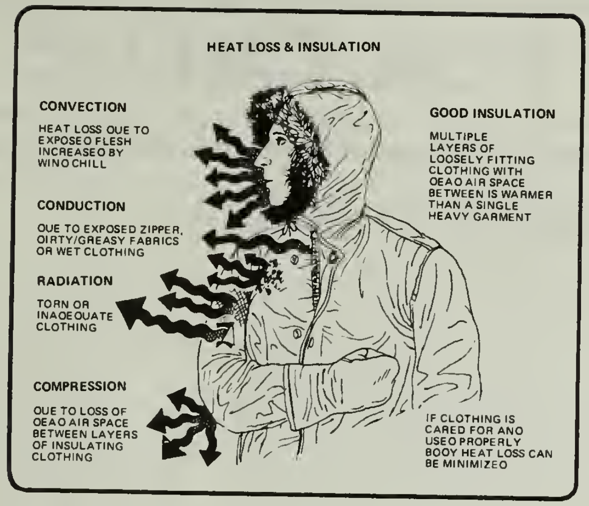
Helen had wrapped the baby in Jack's jacket and three of his shirts, and secured him snugly in a pillow case to form a bunting. She then nestled him in a sleeping bag on a bed of dry pine boughs. The boughs would keep the underside of the sleeping bag from getting wet until Jack could get the tent set up.

All was going well and Jack once again began setting up the tent. He could hear his daughter, Julie, laughing from behind him as he worked. When he turned to see what she was laughing at, he remembered what the instructors had said about another form of heat loss – compression. He tried not to get angry at his daughter as he watched her making "angels" in the snow. He realized that by lying in the snow she was compressing the insulation of her clothing and, therefore, eliminating the dead air spaces. Besides all of that, now she was soaking wet.

Helen and Jack quickly stripped her of wet clothing and put her into the warm sleeping bag with the baby. Jack hung her clothes on poles by the fire to dry, and Helen melted some snow over the fire to make hot chocolate.

It was getting dark quickly, so Jack hurriedly put the finishing touches on the tent. While Helen started cooking dinner from the meager supply of food, Jack went out to look for more firewood. It seemed important to eat if they expected to keep producing heat. Now that their fear was under control, they were all hungry.

Jack was lucky to find a good



supply of firewood close by, but he was not so lucky when he tore a large hole in his pants while returning with wood. Since the heat in his body could escape through the tear in his pants, Helen took the time to make repairs while cooking dinner. She even joked about never getting away from household duties. By now, Julie was out of the sleeping bag and back into dry clothing. Everyone's spirits were improving.

After a warm and nourishing meal, they settled in for the night. All of them slipped into two sleeping bags, zipped together to trap additional body heat. Jack recalled the instructors saying you shouldn't sleep in all your clothes. Your clothes might become too wet or damp and the sleeping bag will soak up body moisture causing a reduction in its insulating qualities. With all your clothing on, you may become too warm, causing you to perspire in the sleeping bag, so they stripped to their underwear. It was the longest night any of them had ever endured. Jack awakened several times to check the weather and to keep the fire going as a signal.

As the morning dawned, bright and beautiful, with blue skies overhead, the temperature had warmed considerably. As Helen was preparing what little food they had left, she started yelling for Julie to be quiet. She had heard something. Listening intently, they realized that a vehicle was coming up the forest service road. Jack ran out to the road just as the vehicle was approaching their car.

The vehicle carried two hunters, anxious to begin their day's hunt. After Jack explained his situation, the hunters gladly took him and his family to a ranger station.

Jack and his family were lucky to be rescued so quickly. Whenever traveling into a remote area, one should always be prepared for the worst. There are basic factors to keep in mind whan faced with a survival situation in cold climates. The main thing to remember is maintaining body heat and the "KEY TO COLD."

Keep it **C**lean
Avoid **O**verheating
Wear it **L**oose in Layers
Keep it **D**ry

Additionally, there are four major forms of heat loss – convection, compression, conduction and radiation. It is mandatory that you avoid these forms of heat loss in order for Survival to equal MAINTENANCE OF BODY HEAT. ■

NEWS FOR CREWS

Career information and tips from the folks at Air Force Manpower and Personnel Center, Randolph AFB, TX.

The ACIA and your career

CAPTAIN JOHN S. SMILEY
Rated Departmental/Joint Career
Management Section

■ "I've met my first gate, so where's my career broadening assignment?" Our career managers at AFMPC hear this question frequently. Since "gates" and gate management are certainly one "piece of the puzzle" in determining assignments, let's review provisions of the Aviation Career Incentive Act (ACIA) as it applies to our ability to respond to your career plans.

The ACIA was passed as Public Law 93-294 in 1974 to ensure that the services maintained a viable rated force. It imposes a utilization standard on rated officers and requires that pilots, navigators, and aircraft observers be assigned to operational flying duties for specific amounts of time by certain career checkpoints commonly referred to as "gates." By meeting these gates, officers will retain their entitlement to continuous aviation career incentive pay, even if not assigned to flying duties. Duties which qualify as gate "counters" are identified by Rated Position Identifier (RPI) codes 1, 2, 6, or 8. RPI 1 and 2 are pilot and navigator line flying positions, RPI 6 is found in either line supervisory positions (Sq CC/Ops Off) or wing staff, and RPI 8 refers to gate-creditable positions at numbered AF, MAJCOM, or higher staff levels. All of these positions require the incumbent to actively fly. RPI codes 3 and 4 identify rated authorizations in the staff other than those requiring operational flying duty and are not "gate" creditable. (RPI 3s are found at Wing level and below while RPI 4 positions equate to numbered AF and higher staff levels.) Rated supplement tours are normally for RPI 0 positions and as a rule do not offer operational flying credit (there are some exceptions).

The gates occur on the anniversary of the 12th and 18th years of aviation service, including time spent in flying training as an officer. By the 12th year of aviation service, an officer must have at least 6 years of operational flying (includes UPT/UNT time) to be entitled to continuous aviation career incentive pay to 18 years of aviation service. (The aviation service date is the date of the original aeronautical order directing participation in flying duties.) At the 18th year of aviation service, an officer must have performed 11 years of operational flying to be entitled to continuous monthly aviation incentive pay through his 25th year of *officer* service. (The officer service date is the officer's commissioning date.) However, if at the 18 year point the officer has performed at least 9 but less than 11 years of operational flying duty, the officer is entitled to continuous pay through 22 years of officer service. If the officer has performed less than 9 years of operational flying at 18 years of aviation service, his entitlement to continuous monthly aviation career incentive pay ceases at that point. He may, however, be paid when he performs flying duty, but any further flying does not count towards attaining subsequent gate credit. Aviation Career Incentive Pay (ACIP) for all personnel terminates at 25 years of *officer* service. Graphically, the ACIA can be depicted as in the chart on page 27.

Being the commonly encountered question which kicked off this article, let's discuss how the ACIA works in individual assignment considerations.

First, there's the question of "how much gate is enough" at any given career point. As an illustration let's assume an officer has just met his or her first gate and has an aviation service date of November 73. If the officer is now assigned to a career broadening assignment for four years, what's the effect on his/her "gate" outlook? The officer has at least 6 years operational flying and is guaranteed incentive pay to 18 years aviation service – November '91. Upon completion of the 4 year nonflying assignment, the officer will have 8 years left to make either the nine-year gate, which would require 3 more years of operational flying, or the eleven-year gate which would require 5 more years of operational flying. (The Air Force goal is to allow the majority of rated officers to meet the 11 at 18 standard while all must meet the 9 at 18 standard.)

At the 10-year point in the above example, if the officer is to make the 11 at 18 standard, he or she has 3 years "left" before his or her 18th year of aviation service for additional non-gate creditable positions. The officer – and his/her career manager – faces severely limited downstream options by allowing for only a three-year "window." Upon reaching field grade rank where non-flying (RPI 3/4) staff positions often include some of the more attractive assignment alternatives, the officer could have less flexibility than others competing for the same job with more gate time to their credit. Our bottom line here is that follow-on utilization options – as well as immediate

gate status—should be given strong consideration in assignment determination.

A second point often leading to misconceptions is how the gates relate to assignments outside the rated requirement structure. After an officer has satisfied the "gate" requirements, the probabilities for flying versus non-flying duty are determined more by the requirements to maintain rated viability (currency). As a general rule, we try to avoid back-to-back assignments not involving flying as either a crewmember or in a staff capacity. Rated viability can be generally determined by measuring how long it has been since the officer flew a major weapon system against how much time he/she has in that (or similar) systems. Rated viability is important in every part of the requirement structure. If you're part of the crew force, you're building or updating your viability in addition to getting gate credits. Most rated staff positions require viability since it's that very experience that qualifies the incumbent to do the job.

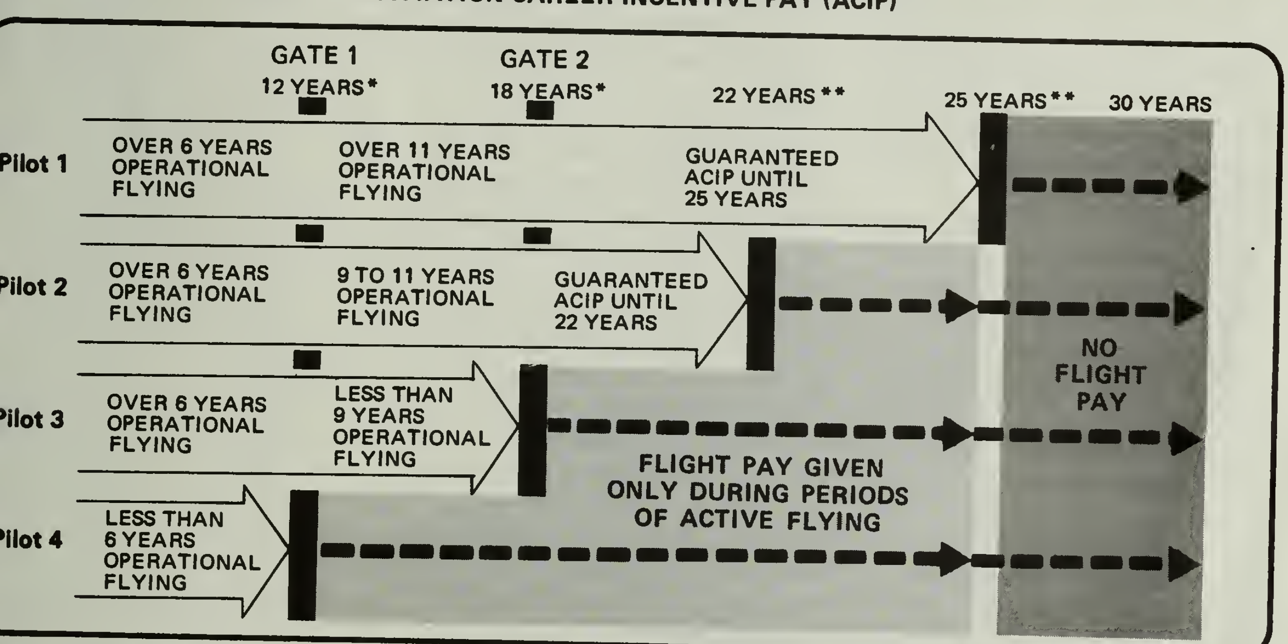
Even the rated supplement requires viability—from two perspectives. First, the primary reason we have the supplement is to provide a ready reserve of rated officers for augmentation and/or replacement during wartime. Plans call for most of our officers serving in the supplement to return to rated duties and enter combat without extensive retraining, so a reasonable degree of currency (viability) is absolutely necessary. Second, as the rated supplement inventory decreases over the next few years, supplement duty will be increasingly restricted to areas where rated presence — expressed in terms of recent experiences in a specific weapon system group—is the overriding requirement.

ACIA helps to ensure that the services maintain a viable rated force by imposing a utilization standard on rated officers. However, simply by meeting gate requirements, a rated officer should not expect automatic assignments out of the rated "arena"—over 90 percent of the requirements for rated officers are in operations and ops related staff positions. While meeting your gates entitles you to incentive pay across a rated career, that pay is tied to the fact that you are a rated officer who is available for rated duties (cockpit or staff) when needed—*throughout your career.* In times of low UPT/UNT rates and a declining supplement, most officers can expect to spend a larger portion of their careers in rated positions. Planning ahead, looking at downstream options, and maintaining rated currency or viability will maximize your chances (and ours) of keeping your career on track. A little forethought and an understanding of how the gate system works can make the ACIA work toward—not against—your personal goals. ■

ABOUT THE AUTHOR

Captain Smiley has been assigned to the Air Force Manpower and Personnel Center as an action officer in the Fighter/RECCE Career Management Section (Nov 76–Nov 78) and the Rated Departmental/Joint Career Management Section (Dec 78–present). Captain Smiley's background includes tours in PACAF, TAC, and USAFE as an F-4 WSO. He will be returning to the F-4 in the PACAF theater (Kunsan AB, Korea) in March 1980.

AVIATION CAREER INCENTIVE PAY (ACIP)



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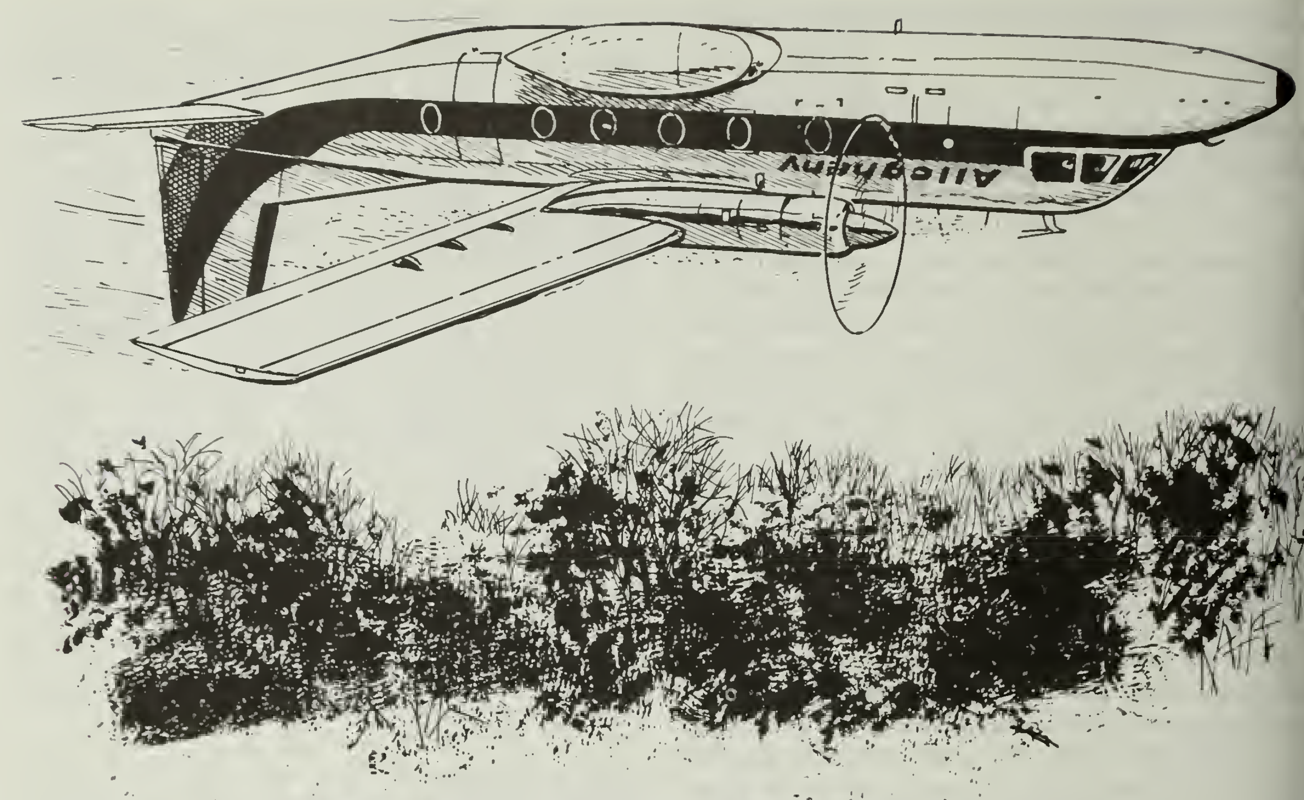

A WINTER WORRY

■ The Allegheny Airlines commuter crash at Clarksburg, West Virginia, last February 12 was caused by the captain's decision to take off with snow on the aircraft's wing and tail surfaces, the National Transportation Safety Board reported.

The snow reduced aerodynamic lift and caused the captain to lose control of his aircraft shortly after takeoff, the Safety Board held.

The copilot and one passenger were killed when the modified twin-engine Nord 262 crashed upside down about 14 seconds after lifting off from Runway 21 of Clarksburg's Benedum Airport. The captain and seven passengers were seriously injured. The flight attendant and 14 passengers survived with minor or no injuries.

The aircraft had been deiced 20 to 30 minutes before it left the ramp, but the Board found that about a quarter of an inch of wet snow had accumulated on the top of the wings and horizontal stabilizer after the deicing.

The captain could remember nothing of the accident, but eyewitnesses said that after a normal takeoff roll and lift-off, the aircraft rolled both to the right and to the left before the right wing struck the runway. The Safety Board concluded that snow which had adhered to the outboard surfaces of the wing, in addition to reducing lift, had rendered the ailerons "at least partially ineffective" after the plane climbed out of "ground effect" the cushioning effect which increases lift and reduces drag when an aircraft is airborne but still close to the ground.

A professional pilot always "must take the proper measures to ensure that the wings, stabilizing surfaces, and control surfaces are clean and free of ice, snow or frost before he attempts a takeoff," the Board said. "Any doubts . . . must be resolved by visual inspection, if necessary, immediately before the takeoff is begun.

The Board's formal determination of probable cause was "the captain's decision to take off with snow on the aircraft's wing and empennage surfaces which resulted in a loss of lateral control and a loss of lift as the aircraft ascended out of ground effect." – Courtesy NTSB Safety Bulletin SB 79-65.

That accident reiterates the time worn adage that the slightest mistake, or lack of knowledge, can be terribly costly in aircraft operation. If you missed the article on the subject of ice on the wings, see "Wing Surface Roughness – Cause and Effect," *Page 16,* Aerospace Safety, *November 1979.* *–Ed.* ■

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CAPTAIN

Eric M. Coloney

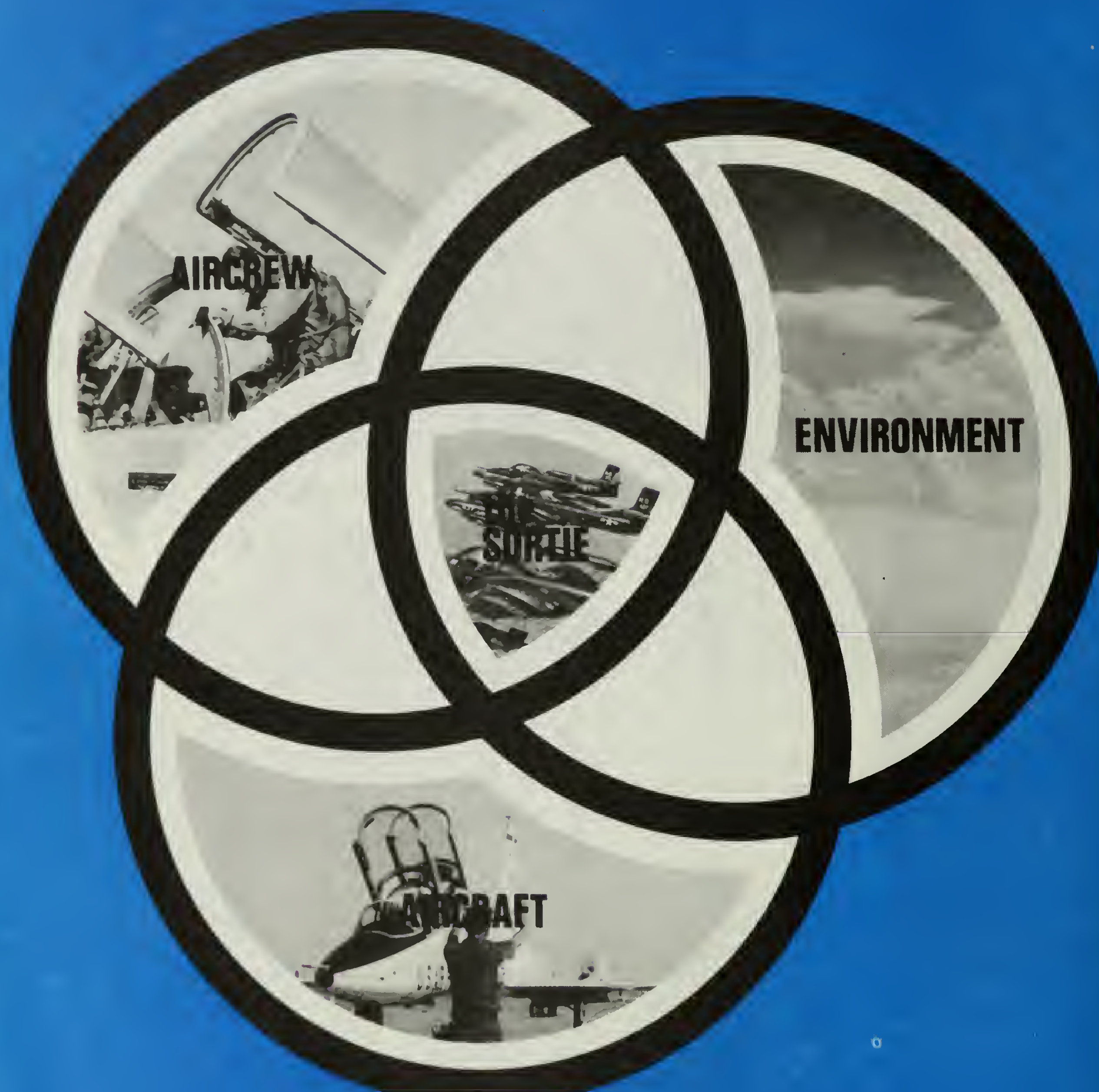
LIEUTENANT COLONEL

John P. Westra

50th Tactical Fighter Wing

■ Captain Coloney, Aircraft Commander, and Lt Col Westra, Flight Surgeon, were on a low level flight near Illesheim Army Air Field, Germany, when they heard a loud explosion. Their F-4E aircraft immediately yawed to the right, the right fire light illuminated, and the EGT increased to 900 degrees. Captain Coloney executed bold face procedures, and pulled off the low level so he could analyze the problem at a higher altitude. He retarded the throttle to idle, but the fire light remained on, so he shut down the engine. Although EGT initially dropped off, it quickly increased to 1,000 degrees, and the fire light remained illuminated. With one engine shut down and indications of an engine fire, Captain Coloney declared an emergency with Illesheim Tower, and flew direct to Nurnberg International Airport since Illesheim's runway was only 3,000 feet long. Although Captain Coloney declared an emergency with Nurnberg Approach Control, and requested radar vectors for landing, Nurnberg was unable to respond until Munich Radar, who was observing the emergency squawk, offered to relay vectors via telephone through Nurnberg to the stricken aircraft. Smoke and haze obscured Nurnberg as Captain Coloney approached the airfield. Meanwhile, the EGT increased and pegged out. At one mile out he visually acquired the field, only to find that the limited radar assistance he had received was intended to assist him in locating the field, and was not actually a final approach. Since a safe landing could not be made from this position, he used the power available to reposition, and made an uneventful landing. Investigators later found that the third stage turbine blades had penetrated the right engine case and bay, damaging the flap and aileron. Other fragments penetrated the number five fuel cell. Captain Coloney's rapid response to this emergency prevented further damage and possible loss of the aircraft. The crew's calm, professional response during the recovery at an unfamiliar civilian field was instrumental in preventing possible injury or loss of life. WELL DONE! ■

Mission Risk Assessment Factor



QUESTION: GO or NO GO TODA

FLIGHT SAFET